The Health Committee submit, for the information of the Council, the following report of the Officer of Health :—

Town Hall, Manchester, (Signed) W. Brown,
23rd May, 1887. *Deputy Chairman.*

[copy]

Report.

The following estimates of population, which were calculated from the Overseers' books 12 months ago (except the population of Harpurhey, Bradford, and Rusholme, obtained from the Registrar-General), will be used to calculate the death rate of 1886 :—

Registration Sub-District	Estimated Population
Ancoats	47,656
Central	38,849
St. George's	60,153
Hulme	75,527
Chorlton-upon-Medlock	56,562
Ardwick	31,907
Cheetham	25,277
Beswick	8,525
Harpurhey	6,655
Bradford	21,157
Rusholme	13,410

Total Population of Manchester—385,678.

The total number of deaths within the homes of the people in the City of Manchester, including Harpurhey, Bradford, and Rusholme, during the year 1886, was 7,967, which, in a population of 385,678, is equal to a death-rate of 20·65 per 1,000; but 550 deaths took place in public hospitals within the City, and 113 in Monsall Hospital (from infectious diseases), of persons removed to that hospital from Manchester. 11 inquests were held on the bodies of persons unknown in the City, and there were 48 inquests on persons drowned, &c. These, added to the preceding number, will raise the death rate to 22·52 per 1,000. Including 834 deaths in Crumpsall Workhouse the death rate will be 24·69 per 1,000.

In the several registration sub-districts of the City, excluding the 59 special coroner's cases and deaths occurring in hospitals, the rates of mortality in the years 1885 and 1886 were :—

Registration Sub-District	Rate per 1,000 of Population	
	1885	1886
Ancoats	23·7	24·4
Central	19·4	21·4
St. George's	22·3	21·8
Hulme	21·4	21·3
Chorlton-upon-Medlock	18·5	19·9
Ardwick	20·0	21·2
Cheetham	14·7	14·4
Beswick	23·5	22·0
Harpurhey	—	18·1
Bradford	—	20·1
Rusholme	—	11·0

Number of deaths and rate per 1,000 in the quarters of the year 1886 :—

	Deaths	Rate per 1,000
March Quarter	2,683	27·82
June ,, ...	2,270	23·54
September,, ...	2,251	23·34
December ,, ...	2,319	24·05

DEATHS IN THE WINTER QUARTER OF 1881, 1882, 1883, 1884, 1885, 1886, AND THE RATE OF MORTALITY.

	1881	1882	1883	1884	1885	Exclusive of Harpurhey, Bradford, and Rusholme 1886
Deaths	2,593	2,063	2,437	2,270	2,263	2,483
Death Rate per 1,000 of Population......	30·36	24·16	28·64	26·56	26·27	28·8

TABLE EXHIBITING THE MORTALITY FROM DISEASES OF THE LUNGS, AND FROM WHOOPING COUGH, FROM 1881 TO 1886, BOTH INCLUSIVE.

1881	
Diseases of the lungs	2,965
Whooping cough	249
Total	3,214

1882	
Diseases of the lungs	2,716
Whooping cough	293
Total	3,009

1883	
Diseases of the lungs	3,039
Whooping cough	247
Total	3,286

1884	
Diseases of the lungs	2,610
Whooping cough	188
Total	2,798

1885	
Diseases of the lungs	2,814
Whooping cough	230
Total	3,044

Exclusive of
Harpurhey, Bradford,
and Rusholme

1886	
Diseases of the lungs	2,902
Whooping cough	211
Total	3,113

TABLE EXHIBITING THE DEATHS FROM DISEASES OF THE LUNGS, AND FROM WHOOPING COUGH, IN EACH QUARTER OF THE YEARS 1881 TO 1886, EXCLUSIVE OF HARPURHEY, BRADFORD, AND RUSHOLME.

	March Quarter		*June Quarter*		*Sept. Quarter*		*Dec. Quarter*	
Year.	Diseases of lungs	Whooping cough	Diseases of lungs	Whooping cough	Diseases of lungs	Whooping cough	Diseases of lungs	Whooping cough
1881...	1,097	54	675	87	444	44	749	68
1882...	667	82	701	109	613	58	735	44
1883...	900	89	825	83	521	38	793	37
1884...	724	74	651	57	510	28	725	29
1885...	830	59	830	102	523	44	631	25
1886...	991	48	763	67	519	53	629	43

The average deaths per annum for the six years (1880–85 inclusive), and the deaths in 1886, from three infectious diseases, of children have been :—

	1880–85	Exclusive of Harpurhey, Bradford, and Rusholme 1886
Whooping cough	251	211
Measles	243	62
Scarlet fever	189	178
Totals	683	451

The deaths from diarrhœa, almost exclusively a disease of the late summer months (August and September), have been during the last six years as follows :—

1881	258
1882	384
1883	365
1884	510
1885	244
1886 (exclusive of Harpurhey, Bradford, and Rusholme)...	451
Total	2,212

DEATHS AND DEATH RATE PER 1,000 OF THE POPULATION FROM ALL CAUSES, INCLUDING THE DEATHS IN MONSALL HOSPITAL AND CRUMPSALL WORKHOUSE.

	Deaths		Rate per 1,000 of Population
Average, 1871–1880	9,556		27·26
1881	8,473		24·78
1882	8,738		25·58
1883	8,922		26·17
1884	8,562		25·22
1885	8,509		24·70
1886	8,823	exclusive of Harpurhey, Bradford, and Rusholme	25·61

DEATHS FROM THE FIVE ZYMOTIC DISEASES.

SMALLPOX, MEASLES, WHOOPING COUGH, FEVER, AND SCARLATINA, INCLUDING DEATHS IN MONSALL HOSPITAL.

	Deaths		Rate per 1,000 of Population
Average, 1871–1880	1,089		3·0
1881	566		1·6
1882	865		2·5
1883	812		2·3
1884	720		2·1
1885	784		2·2
1886	553	exclusive of Harpurhey, Bradford, and Rusholme	1·6

DEATHS FROM TYPHUS FEVER AND TYPHOID FEVER.

	Deaths		Rate per 1,000 of Population
Average, 1871–1880	178		·50
1881	75		·21
1882	116		·33
1883	76		·22
1884	68		·20
1885	65		·18
1886	97	exclusive of Harpurhey, Bradford and Rusholme	·28

NUMBER OF DEATHS AND RATE PER 1,000 OF THE POPULATION IN EACH QUARTER OF THE YEARS 1881 TO 1886.

Year	No. of Deaths	Rate per 1,000 of Population	Year	No. of Deaths	Rate per 1,000 of Population
1881			1884		
March Quarter	2,593	30·36	March Quarter	2,270	26·56
June ,,	1,970	23·04	June ,,	2,049	24·00
September ,,	1,745	20·40	September ,,	2,164	25·35
December ,,	2,165	25·32	December ,,	2,079	24·50
1882			1885		
March Quarter	2,063	24·16	March Quarter	2,263	26·27
June ,,	2,333	27·32	June ,,	2,413	28·02
September ,,	2,205	25·80	September ,,	1,938	22·50
December ,,	2,137	25·04	December ,,	1,895	22·00
1883			1886	Exclusive of Harpurhey, Bradford, and Rusholme	
March Quarter	2,437	28·64	March Quarter	2,483	28·83
June ,,	2,200	25·88	June ,,	2,087	24·23
September ,,	2,008	23·52	September ,,	2,100	24·38
December ,,	2,277	26·64	December ,,	2,153	25·00

DEATHS FROM MEASLES AND RATE PER 1,000 OF POPULATION.

	1885		1886	
	Deaths	Death Rate	Deaths	Death Rate
Ancoats	37	·77	13	·27
Central	36	·92	8	·20
St. George's	76	1·26	7	·11
Hulme	129	1·70	15	·19
Chorlton-upon-Medlock	40	·70	6	·10
Ardwick	33	1·03	5	·15
Cheetham	9	·35	0	—
Beswick	7	·82	0	—
Harpurhey	—	—	1	·15
Bradford	—	—	10	·47
Rusholme	—	—	1	·07
Royal Infirmary	0	—	0	—
Monsall Hospital	2	—	7	—
Crumpsall Workhouse	2	—	0	—
	371	1·07	73	·18

NOTE.—This Table for 1886 includes Harpurhey, Bradford, and Rusholme.

DEATHS FROM MEASLES IN EACH MONTH.

1885		1886	
	Deaths		Death
January	8	January	5
February	9	February	7
March	18	March	8
April	50	April	4
May	69	May	1
June	58	June	4
July	48	July	3
August	47	August	1
September	19	September	3
October	23	October	8
November	13	November	14
December	9	December	15
	371		73

DEATHS FROM WHOOPING COUGH, AND RATE PER 1,000 OF POPULATION.

	1885		1886	
	Deaths	Death Rate	Deaths	Death Rate
Ancoats	40	·83	24	·50
Central	12	·30	19	·49
St. George's	47	·78	53	·88
Hulme	49	·64	52	·68
Chorlton-upon-Medlock	30	·52	28	·49
Ardwick	25	·78	20	·63
Cheetham	13	·51	7	·27
Beswick	6	·70	5	·58
Harpurhey	—	—	6	·90
Bradford	—	—	10	·47
Rusholme	—	—	2	·14
Royal Infirmary	0	—	0	—
Monsall Hospital	0	—	1	—
Crumpsall Workhouse	8	—	2	—
	230	·66	229	·59

NOTE.—These Tables for 1886 include Harpurhey, Bradford, and Rusholme.

DEATHS FROM WHOOPING COUGH IN EACH MONTH.

1885	Deaths	1886	Deaths
January	20	January	18
February	17	February	13
March	22	March	21
April	40	April	29
May	38	May	32
June	24	June	15
July	21	July	29
August	17	August	17
September	6	September	7
October	10	October	9
November	3	November	16
December	12	December	23
	230		229

DEATHS FROM FEVER, AND RATE PER 1,000 OF POPULATION.

	1885		1886	
	Deaths	Death Rate	Deaths	Death Rate
Ancoats	7	·14	13	·27
Central	8	·20	7	·18
St. George's	5	·08	14	·23
Hulme	20	·26	11	·14
Chorlton-upon-Medlock	4	·07	19	·33
Ardwick	3	·09	11	·34
Cheetham	1	·03	1	·04
Beswick	1	·11	2	·23
Harpurhey	—	—	2	·30
Bradford	—	—	8	·37
Rusholme	—	—	0	—
Royal Infirmary	0	—	3	—
Monsall Hospital	16	—	16	—
Crumpsall Workhouse	4	—	6	—
	69	·20	113	·29

NOTE.—These Tables for 1886 include Harpurhey, Bradford, and Rusholme.

DEATHS FROM FEVER IN EACH MONTH.

1885	Deaths	1886	Deaths
January	6	January	17
February	5	February	12
March	13	March	8
April	12	April	6
May	3	May	9
June	3	June	4
July	6	July	9
August	4	August	4
September	1	September	6
October	4	October	12
November	4	November	11
December	8	December	17
	69		113

DEATHS FROM SCARLATINA, AND RATE PER 1,000 OF POPULATION.

	1885		1886	
	Deaths	Death Rate	Deaths	Death Rat
Ancoats	6	·12	7	·14
Central	2	·05	12	·30
St. George's	11	·18	14	·23
Hulme	13	·17	15	·19
Chorlton-upon-Medlock	15	·26	29	·51
Ardwick	7	·21	25	·78
Cheetham	3	·11	6	·23
Beswick	4	·46	2	·23
Harpurhey	—	—	1	·15
Bradford	—	—	5	·23
Rusholme	—	—	4	·29
Royal Infirmary	1	—	0	—
Monsall Hospital	18	—	67	—
Crumpsall Workhouse	0	—	1	—
	80	·23	188	·48

NOTE.—These Tables for 1886 include Harpurhey, Bradford, and Rusholme.

DEATHS FROM SCARLATINA IN EACH MONTH.

1885	Deaths	1886	Deaths
January	14	January	8
February	7	February	4
March	6	March	9
April	6	April	15
May	4	May	9
June	3	June	12
July	3	July	13
August	3	August	13
September	5	September	14
October	9	October	31
November	10	November	32
December	10	December	28
	80		188

DEATHS FROM SMALLPOX.

1885 ....34 Deaths............ { 2 in St. George's. 1 in Cheetham. 31 in Monsall Hospital.

1886 ....No Deaths

DEATHS FROM DIARRHŒA, AND RATE PER 1,000 OF POPULATION.

	1885		1886	
	Deaths	Death Rate	Deaths	Death Rate
Ancoats	43	·90	91	1·91
Central	31	·79	58	1·49
St. George's	46	·76	71	1·18
Hulme	41	·54	90	1·19
Chorlton-upon-Medlock	34	·60	59	1·04
Ardwick	27	·84	50	1·58
Cheetham	10	·39	16	·63
Beswick	4	·46	7	·82
Harpurhey	—	—	3	·45
Bradford	—	—	15	·70
Rusholme	—	—	7	·52
Royal Infirmary	0	—	0	—
Crumpsall Workhouse	8	—	9	—
	244	·70	476	1·23

NOTE.—Tables for 1886 include Harpurhey, Bradford, and Rusholme.

SEASONS IN WHICH THE GREATER NUMBER OF DEATHS OCCUR FROM DIARRHŒA.

1885		Deaths	1886		Deaths
Week ending June	6	1	Week ending June	5	7
,, ,,	13	5	,, ,,	12	4
,, ,,	20	2	,, ,,	19	4
,, ,,	27	2	,, ,,	26	3
,, July	4	1	,, July	3	4
,, ,,	11	6	,, ,,	10	9
,, ,,	18	7	,, ,,	17	2
,, ,,	25	8	,, ,,	24	8
,, Aug.	1	13	,, ,,	31	15
,, ,,	8	14	,, Aug.	7	16
,, ,,	15	20	,, ,,	14	10
,, ,,	22	18	,, ,,	21	17
,, ,,	29	9	,, ,,	28	23
,, Sept.	5	26	,, Sept.	4	43
,, ,,	12	20	,, ,,	11	58
,, ,,	19	15	,, ,,	18	58
,, ,,	26	13	,, ,,	25	38
,, Oct.	3	7	,, Oct.	2	36
,, ,,	10	4	,, ,,	9	16
,, ,,	17	3	,, ,,	16	17
,, ,,	24	1	,, ,,	23	13

TABLE SHOWING THE NUMBER OF DEATHS FROM THE FIVE ZYMOTIC DISEASES, VIZ. :—MEASLES, SMALLPOX, WHOOPING COUGH, SCARLATINA, AND FEVER ; ALSO THE NUMBER OF DEATHS FROM OTHER CAUSES.

	1885			1886		
	Zymotic Diseases	Other Causes	Total Deaths	Zymotic Diseases	Other Causes	Total Deaths
Ancoats	90	1,073	1,163	57	1,161	1,218
Central	58	754	812	46	840	886
St. George's	141	1,206	1,347	88	1,226	1,314
Hulme	211	1,412	1,623	93	1,530	1,623
Chorlton-upon-Medlock	89	969	1,058	82	1,058	1,140
Ardwick	68	573	641	61	618	679
Cheetham	27	401	428	14	437	451
Beswick	18	185	203	9	184	193
Harpurhey	—	—	—	10	112	122
Bradford	—	—	—	33	396	429
Rusholme	—	—	—	7	142	149
Royal Infirmary	1	398	399	3	369	372
Monsall Hospital	67	14	81	91	22	113
Crumpsall Workhouse	14	740	754	9	825	834
	784	7,725	8,509	603	8,920	9,523

Death from Diseases of the Lungs, and Rate per 1,000 of Population.

1885

	Deaths at all Ages	Rate per 1,000 of Population	Deaths under 5 years
Ancoats	393	8·24	115
Central	275	7·07	95
St. George's	438	7·28	145
Hulme	552	7·29	187
Chorlton-upon-Medlock	356	6·29	97
Ardwick	191	5·98	58
Cheetham	114	4·51	37
Beswick	83	9·73	39
Royal Infirmary	57	—	1
Monsall Hospital	3	—	0
Crumpsall Workhouse	352	—	15
	2,814	8·16	789

Deaths from Diseases of the Lungs, and Rate per 1,000 of Population.

1886

	Deaths at all Ages	Rate per 1,000 of Population	Deaths under 5 years
Ancoats	434	9·10	133
Central	282	7·25	76
St. George's	382	6·35	121
Hulme	548	7·25	169
Chorlton-upon-Medlock	352	6·22	80
Ardwick	209	6·59	70
Cheetham	143	5·65	41
Beswick	58	6·80	24
Harpurhey	37	5·56	9
Bradford	144	6·80	67
Rusholme	49	3·65	10
Royal Infirmary	57	—	0
Monsall Hospital	6	—	0
Crumpsall Workhouse	431	—	13
	3,132	8·12	813

TABLE SHOWING THE AGES AT DEATH; ALSO THE PROPORTION PER CENT. WHICH THE DEATHS AT EACH AGE BEAR TO THE TOTAL DEATHS.

1885

	Under 1 year	Under 5 years	5 years and above	Total Deaths	Rate per cent. under 1 year	Rate per cent. under 5 years	Rate per cent. 5 years. and above
Ancoats	376	607	556	1,163	32·33	52·19	47·81
Central	190	351	461	812	23·40	43·22	56·78
St. George's	405	722	625	1,347	30·08	53·60	46·40
Hulme	468	827	796	1,623	28·83	50·95	49·05
Chorlton-upon-Medlock	261	445	613	1,058	24·66	42·06	57·94
Ardwick	183	313	328	641	28·55	48·83	51·17
Cheetham	87	165	263	428	20·32	38·55	61·45
Beswick	65	107	96	203	32·02	52·71	47·29
Royal Infirmary	5	20	379	399	1·25	5·01	94·99
Monsall Hospital	0	0	81	81	—	—	—
Crumpsall Workhouse	66	86	668	754	8·75	11·40	88·60
	2,106	3,643	4,872	8,509	24·73	42·78	57·22

TABLE SHOWING THE AGES AT DEATH; ALSO THE PROPORTION PER CENT. WHICH THE DEATHS AT EACH AGE BEAR TO THE TOTAL DEATHS.

1886

	Under 1 year	Under 5 years	5 years and above	Total Deaths	Rate per cent. under 1 year	Rate per cent. under 5 years	Rate per cent. 5 years and above
Ancoats	405	648	570	1,218	33·2	53·2	46·8
Central	251	380	506	886	38·3	42·9	57·1
St. George's	391	675	639	1,314	29·7	51·4	48·6
Hulme	518	784	839	1,623	31·9	48·3	51·7
Chorlton-upon-Medlock	292	447	693	1,140	25·6	39·2	60·8
Ardwick	213	336	343	679	31·3	49·4	50·6
Cheetham	108	179	272	451	23·9	39·7	60·3
Beswick	60	97	96	193	31·1	50·3	49·7
Harpurhey	32	52	70	122	26·3	46·4	53·6
Bradford	147	238	191	429	34·2	55·4	44·6
Rusholme	28	42	107	149	18·8	28·2	71·8
Royal Infirmary	3	14	358	372	·8	3·8	96·2
Monsall Hospital	0	2	111	113	—	1·8	98·2
Crumpsall Workhouse	36	56	778	834	4·3	6·7	93·3
	2,484	3,950	5,573	9,523	26·1	41·5	58·5

The estimated death-rate of the City for the year 1886 (24·69) is exactly that of the preceding year (24·70), but that has arisen by the inclusion of Harpurhey, Bradford, and Rusholme within the City boundaries, for the death-rate of the old City was slightly higher than that of 1885 (viz. :—25·61). The rise has taken place only in certain registration sub-districts, viz. :—Ancoats, 24·4, against 23·7 of 1885; Central, including the old Deansgate, London Road, and Market Street sub-districts, 21·4, against 19·4; Chorlton-upon-Medlock, 19·9, against 18·5; Ardwick, 21·2, against 20·0, whilst St. George's and Beswick had a smaller rate of mortality than in 1885. Hulme and Cheetham an almost identical rate with that of 1885.

The difference in the number of deaths in 1885–86 was 314, to account for which we had an excess of deaths from diarrhœa of 232, and 108 from scarlet fever. The total deaths in 1886 from five zymotic diseases, viz. :—Smallpox, measles, whooping cough, fever, and scarlatina, including the deaths in Monsall Hospital, but excluding those in Harpurhey, Bradford, and Rusholme, were 5·53, against 7·84 in 1885, the death-rate being 1·6, against 2·2 in 1885.

From fever, comprehending typhus and typhoid, the deaths were 97, equal to a rate of 0·28, and in excess of those in 1885. There was an extraordinary reduction in the deaths from measles, the total number, including those from Harpurhey, Bradford, and Rusholme, were 73, against 371 in 1885. The largest number of deaths were in November and December, whilst in 1885 they ranged from April to August. From smallpox there was not a single death.

The deaths from whooping cough were equal in the two years 1885 and 1886, viz. :—230 and 229. The deaths from fever seem to have been scattered, without much difference in relation to population, throughout the City. In October, 1886, there was a sudden rise in the deaths from scarlet fever, the number of cases having been very large, and the increase over the normal amount has been sustained up to the middle of the present month (February, 1887). Great efforts have been made to arrest the spread of the disease. Every case where possible has been isolated, being sent to hospital, and the houses in which the cases occurred have been thoroughly disinfected. Many of the Clergy, Conductors and Managers of Schools, and others have been communicated with, and the Officer of Health desires to express his sense of the readiness, kindness, and courtesy which he has received from these gentlemen. Farmers, from whom the milk supply of the City has been furnished, have, when within reasonable limits, been visited by the officers of the Corporation, whilst the Officer of Health has placed himself in communication with his brethren in Derbyshire, Shropshire, Staffordshire, and Cheshire, from which Counties much milk has been received, and they have kindly made such enquiries as to preclude the idea of the infection being conveyed in the milk from these distant localities.

The deaths from scarlet fever for the entire City, with Monsall Hospital, in 1886 were 188, against 80 in 1885. So many places were affected with scarlet fever during the year that it appeared as if a wave of this special infection was passing over the country. In former publications the Officer of Health has discussed the apparent replacement of these diseases one by another. Thus the decline of measles has been attended by a rise in scarlet fever, and the continued observations of many years have shown that this is a frequent phenomenon. From diarrhœa, the deaths were 476 in 1886 against 244 in 1885. As usual the largest number of deaths occurred in the poorest and densest districts. The principal mortality lay in August, September, and October, and amongst young children. There is no disease with which we have to cope which seems to depend so entirely on the year's climate as this. The remedies are plenty of ventilation and proper food for the young victims to whom it is so fatal. The death rate from diseases of the lungs in 1886 was 8·12, against a nearly similar death rate, 8·16, in 1885. The heaviest rate was in Ancoats, 9·10, and the lowest in Rusholme, 3·65.

The Corporation has dealt to a large extent with the nuisances affecting the atmosphere of Manchester external to the houses, with the exception of the smoke nuisance, with which it seems hopeless to contend; but the array of facts brought forward in this report emphatically point to the next work of the local authority in improving the health of the City, and that is in providing more open spaces for the people; opening out imperfectly ventilated courts; crossing narrow streets by other streets at right angles; enlarging the capacity of houses; and relieving the effects of density of population by the most ample ventilation that can be provided. The poor suffer from all causes of mortality, in larger proportion than should be their lot, from the vitiated atmosphere which they are constantly breathing, a death-laden fluid to the old and to the young, to the feeble and to the strong.

ESTIMATION OF POPULATION.—CENSUS.

MANCHESTER.

The population of Manchester, in the intervals of the census, has been calculated on the assumption, by the Registrar-General, that the rate of increase or decrease ascertained at any census for the preceding ten years would be continued during the succeeding ten years. This, however, was found to be a very fallacious manner of determining the population. Thus, the estimation of the population of Manchester by the Registrar-General, for the year 1869, was 370,892, and for the year 1870, 374,995. The census result for 1871 gave 348,791 as the actual population, or an error of 26,204 on the estimate of population for 1870. This is a small amount in comparison with that of Glasgow, which exceeded 89,000.

Similarly, the estimate of the city population for 1880, reckoned on the same basis, was 367,062. The census in the early part of the following year gave 341,508, showing a difference between the actual and estimated numbers of 26,554. But in the same month of 1881 in which the census was taken, the occupied houses were all counted by the officers of the Overseers of the Poor for the purpose of assessment, and the number of houses counted and entered in the Overseers' books was 1,054 in excess of those enumerated under the census, and if the figure 5 be taken as the average number of persons residing in each house, the number of total inhabitants counted at the census would be 346,684, or an addition of 5,270. Looking at the way in which the figures are obtained, the house estimates appear to me to be the most worthy of confidence.

The census of Manchester, and of the other large towns of Great Britain, is taken by a body of men called "Enumerators," whose districts contain from 80 houses to 140 houses, as nearly as I remember. These districts are portions of registration sub-districts, and are called "Enumerators' districts." The Registrar of each registration sub-district, having made preliminary arrangements respecting the size of the enumerators' districts, advertises for men to offer themselves for the performance of the duties connected with the counting of the houses, distributing the schedules, re-collecting them, and to assist in filling them up, &c. The persons offering themselves are, some of them, suitable, and very many unsuitable. As the pay is small, and the work considerable, the class of persons offering their services is not one to be thoroughly relied upon. Very many are persons out of employment, or at a loose end, as it is called, mostly very illiterate, and with perhaps not the most commendable habits. The wonder is that, on the whole, the census should be fairly well taken. Almost at the same time in the year that the Government census is taken the inhabited houses in Manchester are counted for rating purposes by the officers of the Overseers of the Poor, and as these men are accustomed to the work, are perfectly well acquainted with the districts to which they are assigned, and perform the work every year, it may be supposed that their determination of the number of houses will be more accurate than that of the census enumerators.

Much as we may be disposed to rely upon the accuracy of the census, therefore, and fully recognising the great care of the superior officers in the census investigations, the great labour bestowed upon them, and the skill and ability brought to bear, I think it must be admitted that there is a fundamental error in the actual enumeration of the houses, and consequently of the inhabitants of a district.

If the officers of the Overseers could revise the returns of the enumerators, and compare the lists of the houses scheduled and from which schedules have been collected, with the lists furnished to the Assessors, it seems to me that every error or omission would be detected. It would be necessary, of course, that the Assessors' lists should be prepared a little before the taking of the census.

In estimating the population by the multiplication of the actual number of houses by the house-unit, or average number of inhabitants to each house, of a district as determined at the preceding census, it must be borne in mind that this house-unit varies somewhat, not only in the ten years' interval of each census, but from year to year in the intervening period. At each census the average house-unit is obtained for each registration sub-district, and the representative unit varies not only for each period of ten years, but for each registration sub-district. The number per house, or house-unit, in Manchester ranges from four and a fraction to five and a fraction.

The average house-unit, or number per house, has been taken separately for each registration sub-district in Manchester, of which there were nine before the recent addition of Townships to the City. Some of the registration sub-districts were grouped into Townships, others were co-equal in area with their respective Townships. The following numbers express the house-units in the several Townships of Manchester :—

	House-unit	
	1871	1881
Manchester	5·33	5·05
Cheetham	5·9	5·7
Hulme, Ardwick, and Chorlton-upon-Medlock	5·02	5·04
Beswick	5·02	4·96

The City of Manchester at the time of the last census was divided into eight registration sub-districts, containing very unequal amounts of population, but all of them too large for comparative statistical purposes, with the exception of Beswick.

The population is expressed in the following figures :—

Ancoats	47,978
St. George's	59,128
Central	41,688
Hulme	72,147
Chorlton-upon-Medlock	55,598
Ardwick	31,197
Cheetham	25,721
Beswick	7,957

These numbers are much too large for use in comparing the rate of mortality in different portions of the City.

The registration sub-districts were therefore severally divided into a number of smaller districts, which, for purposes of convenience, were called sanitary districts.

Registration Sub-district	Sanitary Districts	Acreage
Ancoats	No. 1	32 acres
,,	,, 2	33 ,,
,,	,, 3	28 ,,
,,	,, 4	14 ,,
,,	,, 5	35 ,,
,,	,, 6	38 ,,
,,	,, 7	22 ,,
,,	,, 8	27 ,,
,,	,, 9	27 ,,
,,	,, 10	44 ,,
,,	,, 11	63 ,,
,,	,, 12	34 ,,
Market Street	,, 1	42 ,,
,,	,, 2	67 ,,
,,	,, 3	58 ,,
,,	,, 4	91 ,,
London Road	,, 1	70 ,,
,,	,, 2	61 ,,
,,	,, 3	98 ,,
Deansgate	,, 1	68 ,,
,,	,, 2	63 ,,
,,	,, 3	34 ,,
,,	,, 4	94 ,,
St. George's	,, 1	55 ,,
,,	,, 2	62 ,,
,,	,, 3	62 ,,
,,	,, 4	52 ,,
,,	,, 5	24 ,,
,,	,, 6	33 ,,
,,	,, 7	36 ,,
,,	,, 8	48 ,,
,,	,, 9	41 ,,
,,	,, 10	51 ,,
,,	,, 11	37 ,,
Hulme	,, 1	51 ,,
,,	,, 2	51 ,,
,,	,, 3	31 ,,
,,	,, 4	39 ,,

Registration Sub-district	Sanitary District	Acreage
Hulme	No. 5	38 acres.
,,	,, 6	43 ,,
,,	,, 7	49 ,,
,,	,, 8	46 ,,
,,	,, 9	44 ,,
,,	,, 10	39 ,,
,,	,, 11	46 ,,
Chorlton-upon-Medlock	,, 1	62 ,,
,,	,, 2	41 ,,
,,	,, 3	45 ,,
,,	,, 4	47 ,,
,,	,, 5	47 ,,
,,	,, 6	48 ,,
,,	,, 7	30 ,,
,,	,, 8	38 ,,
,,	,, 9	35 ,,
,,	,, 10	35 ,,
,,	,, 11	39 ,,
,,	,, 12	37 ,,
,,	,, 13	38 ,
,,	,, 14	52 ,,
,,	,, 15	52 ,,
Ardwick	,, 1	52 ,,
,,	,, 2	27 ,,
,,	,, 3	37 ,,
,,	,, 4	53 ,,
,,	,, 5	38 ,,
,,	,, 6	71 ,,
,,	,, 7	49 ,,
,,	,, 8	65 ,,
,,	,, 9	26 ,,
,,	,, 10	38 ,,
,,	,, 11	53 ,,
Cheetham	,, 1	34 ,,
,,	,, 2	46 ,,
,,	,, 3	53 ,,
,,	,, 4	70 ,,
,,	,, 5	54 ,,
,,	,, 6	68 ,,
,,	,, 7	73 ,,
,,	,, 8	75 ,,

Registration Sub-district	Sanitary District	Acreage
Cheetham	No. 9	68 acres.
”	” 10	54 ”
”	” 11	47 ”
”	” 12	62 ”
”	” 13	67 ”
”	” 14	59 ”
”	” 15	47 ”
”	” 16	42 ”
Beswick	” 1	54 ”
”	” 2	40 ”

Thus it will be seen that there are 12 sanitary districts in Ancoats, 4 in Market Street district, 3 in London Road district, 4 in Deansgate district, 11 in St. George's, 11 in Hulme, 15 in Chorlton-upon-Medlock, 11 in Ardwick, 16 in Cheetham, and 2 in Beswick; in all 89 sanitary districts. In Ancoats, the population ranges from 6,321 to 2,922 (the population is dense); in Market Street, from 4,103 to 679; in London Road, from 9,793 to 2,447; in Deansgate, from 5,638 to 836; in St. George's, from 10,601 to 2,102; in Hulme, from 9,802 to 2,893; in Chorlton-upon-Medlock, from 8,254 to 1,126; in Ardwick, from 5,682 to 983; in Cheetham, from 5,275 to 65; whilst Beswick has two districts with 4,630 and 3,610 inhabitants.

In districts containing a small number of inhabitants the areas have either not been much built upon (as in No. 11, Ardwick, and Nos. 5, 7, 8, 11, 13, 14, 15, and 16, Cheetham) or the houses have been extensively removed for commercial improvement (as in No. 4, Market Street, and No. 1 Deansgate). In a few years some of the districts in the centre of the City will be extinguished as inhabited districts, whilst in Ardwick and Cheetham the areas will be filled up by new erections.

The number of inhabitants in each sanitary district was determined by multiplying the number of houses by the house-unit of the registration sub-district, as obtained by the census in 1881. These figures, expressive of the house-unit, will have been pretty correct during the year of the census, but they are liable to variation in each year following that of the census by immigration and emigration, and by a variety of causes which will readily suggest themselves. The number of houses occupied will also vary considerably within a few years, being dependent much on the state of trade and a variety of other circumstances; thus, the multiplier and multiplicand are liable to be seriously affected during the middle of the decennial period and the subsequent intervening years. To obtain accuracy, as nearly as possible, the inhabited houses in the Overseers' books are counted by the officers of the Health

Department every year, but the multiplier or house-unit cannot be corrected in the intervals of the census. It will be seen, therefore, how difficult it is to obtain a true estimate of the population of a great city in the intervening years of the census takings. Dr. Russell, of Glasgow, has divided his city into 24 sanitary districts, whilst I have laid out Manchester in as many as 89, thus affording more minute means of comparison than by a smaller number. Of course it is easy to group any number of these and thus make larger districts for special purposes. They have all a relation to and contain a fixed number of the enumerators' districts under the census.

After the census of 1871, I constructed a map of the enumeration districts contained within the City, and gave in my report a description, with tables of these districts. This I was able to do from the census enumerators' books, kindly lent to me by the late Registrar-General. I soon found, however, that the districts were too small to exhibit any moderate permanency in the number of inhabitants, or in any death-rates to be derived from the number of deaths. One or two additional deaths made a large difference in the *rate* of mortality or death-rate. And this was again subject to fluctuation from the movements of the population. The City was, therefore, mapped out into larger districts, including a certain fixed number of enumeration districts, and these, perhaps, it may not be desirable to disturb, as they are sufficiently small for minute sanitary enquiry, and can easily be grouped into larger districts for special purposes. In my last report I gave a map of these districts for the entire City as it was in 1881, and in my previous reports carefully coloured maps, worked out in great detail, of each sanitary district, showing the dwelling-houses and their ages, showing the time at which they were built, and the property not used for dwelling purposes.

They are all drawn to a scale, and exhibit all courts, passages, &c., in fact furnish complete details of the districts. Accompanying these maps are tables, showing the width of the streets, courts, and passages, and their elevation above the sea-level, and direction of the sewage, population, death-rates, and classified details of mortality. Perhaps it is not too much to say that they are the most complete maps and descriptions that have been worked out or published. Knowing how much co-operation is required in improving the health of the City, these maps and details were intended to facilitate the enquiries and operations of any benevolent persons desirous and willing to aid the Health Department in its work. The difficulty of determining the population of any sanitary district, in the intervening years between those of the census, is increased by the irregularity with which changes in the population take place. Neither increase nor decrease takes place according to any rule, or in any fixed proportion, and the difficulty of obtaining a death-rate, under these circumstances of unknown increase or decrease, has led the Officer of Health to count the number of houses actually occupied in each year of his report, from the Assessors' books. There is nothing but the actual counting of the people, as well as the houses, at short intervals, that will give us the means of forming correctly tables even of a house death-rate.

The estimation of the population of a district, in the intervening years of the census, can only be made of the entire population living within it at all ages, as there are no means, independently of an entire census, of determining the proportion at different ages, for these will vary in relation to the total in every year, the greatest difference however being observable at the youngest ages.

From the different mode of estimating the population and determining the death-rate in Glasgow, the Registrar-General has in some years differed in the death-rate from the estimation of Dr. Russell, the very able Medical Officer for Glasgow, by two per 1,000.

Perhaps few stronger instances of error in estimation of population, and consequently of death-rates, than those furnished by Dr. Russell, in the cases of Dundee, Greenock, and Glasgow, can be found. The current death-rates of Dundee were calculated, between 1871 and 1881, on the supposition that the population had been increasing at the rate of 1861-71, viz., 31·7 per cent. in ten years, whereas the census of 1881 showed that the increase had been only 18 per cent. Greenock had in like manner been credited with an increase of over 36 per cent., whereas it was found to have been only a little over 15 per cent. Glasgow had a presumed increase of 21·6 per cent. in ten years, whereas the actual increase was found to have been only 4 per cent.

The division of the registration sub-districts into smaller areas, limited by fixed lines and called sanitary districts, was laid out not only to enable us to construct tables of comparative mortality, in themselves most valuable, but also to get most intimately acquainted with each district and to compare one with another.

The term death-rate expresses the relation of the deaths in any district to the total population of that district. The population unit generally accepted is 1,000 people of all ages. The larger the district, or, in other words, the greater the number of persons in any district, and the smaller the apparent fluctuation in the death-rate. But, beyond a certain population, the expression of the death-rate does not give the relative salutary conditions of an area which requires to be investigated. There are obvious reasons why the death-rate should be higher in one portion of a district than in another—unfavourable conditions of the site on which houses are built; size and bad sanitary condition of the houses themselves; size of the rooms, and consequent relative density of the population resident in the dwellings; habits of the inhabitants; and income, determining the food, clothing, &c. Even in the sanitary districts into which Manchester is divided, some of them containing not less than 6,000 inhabitants, the fluctuation of the death-rate from year to year has been so considerable that in the final table of relative mortalities in these different districts I have to take an average of five years' deaths in each, beginning with the census year. In subsequent years I shall group a number of these districts wherein the death-rate is nearly alike. It is necessary to form two estimates—one of the death-rate deduced from the deaths in the homes of the people, the other including the deaths in hospitals and other places outside those districts. From the great difficulty, if not impossibility, of accurately distributing the deaths over the smaller areas, estimates founded on the first principle are the most reliable. I think it was the late Dr. Farr who, in a conversation that I had with him on this subject, suggested that all deaths outside the homes of the people throughout England should be distributed amongst the different registration districts of the country in proportion to the population; but even this would not be actually accurate, though, in comparison with any other method, probably the most nearly approximative. The most difficult matter to investigate is the relative immigration and emigration in large towns. In London it seems to me impossible to estimate it; and even in large towns, like Manchester and Glasgow, it is very difficult. Can an Irish immigrant, who comes to Manchester to seek work, or makes it a halting place between one agricultural district and another, intending to remain only a few weeks, but falling ill and dying amongst us, probably in a hospital, be said to be an inhabitant of Manchester, though swelling our death-rate?

Amongst the most important factors in the production of a high death-rate is density of population, which term represents the number of persons dwelling on a given area, of which latter an acre is generally accepted as the unit. The following table, given by Dr. Russell in his last report on Glasgow, will show the influence of this in a number of large towns:—

Town	Population	Area in Acres	Density	Mean Death-rate 1876-80
London	3,831,719	75,362	51	22·6
Liverpool	554,073	5,210	106	27·6
Glasgow	511,532	6,111	84	26·7
Birmingham	402,314	8,400	48	23·1
Manchester	341,173	4,293	80	27·4
Leeds	310,483	21,572	15	23·0
Sheffield	285,619	19,651	15	22·7
Edinburgh	228,190	4,180	55	21·2
Bristol	207,522	4,452	47	23·4

This table shows that Liverpool, Glasgow, and Manchester are the three largest and densest towns in the country, and have the highest death-rate. Leeds and Sheffield have a larger circumferential area, and so the suburbs reduce the death-rate, as in many other towns. Till the addition of Rusholme to Manchester the City had scarcely any suburb. It was essentially a City of cottages, and is mainly so still. Even Salford, with the addition of Higher and Lower Broughton and Pendlebury must have its death-rate largely reduced by these.

The Scotch census gives not only the number of inhabited houses, but the number of apartments in each house, and the number of inhabitants living in each house. The term house is in Scotland applied to that portion of a tenement which is occupied by a family, and thus a tenement embraces many houses in the Scotch sense. Examining into the size of these houses, Dr. Russell found that the size of house was largest in Perth and Edinburgh, where there are 4·96 and 4·19 rooms per house, and smallest in Glasgow, where there are 2·34 rooms per house. Aberdeen, Leith, Perth, and Edinburgh had death-rates below 24, and houses of three to five rooms. Dundee, Greenock, Paisley, and Glasgow had death-rates above 25, and houses below three rooms. The death-rate diminished with the size of the averaged house.

It is impossible to look over the beautifully coloured maps, or plans of sanitary districts, in my former reports without seeing that a very large portion of the area of most of the districts is occupied by mills, factories, workshops, and other commercial buildings, churches, chapels, and other unoccupied erections, so that the portion of the district actually occupied by dwelling-houses is but a limited portion of the entire area. The total area of each district, for a large part of the City, has been carefully measured, and the portion occupied solely by dwelling-houses is at the present time in course of measurement. Thus only shall we be enabled to measure roughly the density of the population in the whole City, for that may be measured more importantly in the adaptation of the size of the rooms to the resident occupants than in any other way. In Scotland, Dr. Russell found that the four towns which have the highest death-rates are Glasgow, Paisley, Greenock, and Dundee, and these are the four towns whose inhabitants are most crowded in their houses. The crowding and the death-rate increase *pari passu*. The number of persons per inhabited room rises thus—Dundee, 1·870 ; Greenock, 1·970 ; Paisley, 1·984 ; Glasgow, 2·054—and the death-rates rise thus in the same order—25·7, 27·4, 27·8, 28·6 per 1,000 of the population. If we exclude Perth and Edinburgh, it is the fact that in the remaining six towns of Scotland the mortality rises *pari passu* with the number of persons per inhabited room. The most crowded houses—namely, those with between three and four inmates—are found in the most unhealthy towns—namely, Greenock, Paisley, and Glasgow. Aberdeen and Perth, which are the healthiest towns, have absolutely the fewest inmates in their small houses—namely, between two and three. These remarks apply to the so-called one-apartment houses.

In many respects the social relations of Manchester and Glasgow are so much alike that whatever largely affects the vital standing of the population of one city has very great interest for that of the other. The large proportion of the population of each city engaged in the operative work of cotton mills, factories, calico-printing works, machine making, iron work generally, and trades bearing upon these, the extent and density of each population and their mode of living, make them amenable in a large degree to the same exciting causes of disease. Their health is also generally deteriorated by long exposure to similar injurious agencies.

The mean number of rooms per house in Glasgow in 1881 was 2·322, and the mean number of persons per room 2·040.

The following table, exhibiting the death rate in each sanitary district of Glasgow in relation to the number of rooms per house, and also in relation to the number of persons per room, is interesting. Dr. Russell carries the investigation into the relative amount of mortality from special causes under the conditions of more or less population and size and number of rooms :—

GLASGOW.

Districts arranged in order of mean number of rooms per house from highest to lowest, with general and special death-rates :—

District	Mean Rooms per house	Mean Death-rate per 1,000
Blythswood	4·046	16·1
Kelvinhaugh	3·883	17·2
St. Enoch's Square	3·495	24·4
Monteith Row	3·078	21·0
Exchange	2·955	21·7
Woodside	2·709	20·9
Kingston	2·671	21·8
St. Andrew's Square	2·539	28·7
Bellgrove and Dennistoun	2·304	23·1
Brownfield	2·127	30·7
Gorbals	2·027	29·0
Anderston Square	1·986	28·4
Hutcheson Square	1·985	21·8
St. Rollox	1·981	24·9
Lauriston	1·972	27·2
High Street and Closes W.	1·946	29·9

District	Mean Rooms per house		Mean Death-rate per 1,000
Springburn and Maryhill	1·924	......	22·4
Bridgegate and Wynds	1·855	......	38·3
High Street and Closes W.	1·830	......	37·8
Port Dundas	1·799	......	27·3
Calton Proper	1·795	......	30·9
Greenhead	1·762	......	26·7
Cowcaddens	1·701	......	32·0
Barrowfield	1·679	......	30·3
Whole City	2·322	......	25·2

Glasgow.

Districts arranged in order of mean number of persons per 1,000 rooms from lowest to highest, with general and special death-rate. Mean 1880–1–2.

District	Persons per 1,000 rooms		Mean Death-rate per 1,000
Blythswood	1,250	......	16·1
Kelvinhaugh, &c.	1,299	......	17·2
St. Enoch's Square	1,566	......	24·4
Exchange	1,669	......	21·7
Monteith Row	1,682	......	21·0
Woodside	1,750	......	20·9
Kingston	1,792	......	21·8
St. Andrew's Square	1,974	......	28·7
Bellgrove and Dennistoun	2,049	......	23·1
Hutcheson Square	2,300	......	24·9
Gorbals	2,350	......	29·0
Brownfield	2,352	......	30·7
Anderston Proper	2,376	......	28·4
St. Rollox	2,377	......	21·8
Lauriston	2,408	......	27·2
Calton Proper	2,480	......	30·9
High Street and Closes W.	2,496	......	29·9
Springburn and Maryhill	2,580	......	22·4
Barrowfield	2,598	......	30·3
Greenhead and London Road.	2,615	......	26·7
High Street and Closes E.	2,627	......	37·8
Cowcaddens	2,646	.....	32·0
Port Dundas	2,764	......	27·3
Bridgegate and Wynds	2,946	......	38·3
Whole City	2,040	.....	25·2

If we compare these tables we find that there are eight districts which have houses the mean size of which is *above* the size of the " Standard House " (the latter term representing the mean of rooms per house in the City, as the mean number of persons per room represent the "Standard of Occupancy)," and that the same eight districts have rooms below the " Standard of Occupancy." There are also 16 districts which have houses the mean size of which is below the "Standard House," and the same 16 districts have rooms above the " Standard of Occupancy." From these facts Dr. Russell deduces the following :—

Laws of Occupancy.

" That the smaller the house the greater the number of inhabitants per room ; or, in other words, the smaller the house the less the cubic space per inmate. *Vice versa*, therefore, the larger the house the fewer the number of inhabitants per room ; or, in other words, the greater the cubic space per inmate.

Density.

" In describing the districts we pointed out that the density was, as a rule, fictitious from such causes as the area devoted to public parks, the extent of as yet unbuilt ground, and the presence of railway stations, large public works, &c. No one, however, will dispute the fact that the larger the houses the lower the true density, and the smaller the houses the higher the true density. This is a recognised fact in the economies of house provision, but it is practically impossible to calculate the true density of small areas of towns. We call the fact to remembrance here because it intensifies the hygienic gravity of the " Law of Occupancy." We have therefore two sets of districts, the one of which has houses the mean size of which is above the size of the " Standard House," and rooms which are inhabited below the " Standard of Occupancy," the other of which has houses and rooms, which as to size and occupancy are the reverse.

" Of the eight districts having houses *above* the " Standard House" as to size, and below the " Standard of Occupancy," all except one had a death-rate *below* the standard death-rate. Of the 16 districts having houses below the " Standard House" as to size, and *above* the " Standard of Occupancy," all except four had a death-rate *above* the standard death-rate.

Relation of District Death-rates from Acute Diseases of the Lungs to House Accommodation.

" The mean death-rate of the City from *acute diseases of the lungs* was 579 per 100,000 (5·79 per 1,000). We shall call this the " Standard death-rate from acute diseases of the lungs."

"Of the eight districts having houses *above* the "Standard House" as to size, and *below* the "Standard of Occupancy," all *except one* had a death-rate from acute diseases of the lungs *below* the standard death-rate. The exception was again District 10, or St. Andrew's Square, which had the smallest houses and the highest number of occupants per room in this group of districts, and a death-rate of 7·48 from acute diseases of the lungs. Of the 16 districts having houses *below* the "Standard House" as to size, and *above* the "Standard of Occupancy," all *except four* had a death-rate from acute disease of the lungs *above* the standard death-rate. The exceptions were, Districts 5, or Bellgrove and Dennistoun; 4, or St. Rollox; Springburn and Maryhill; and 7, or Greenhead and London Road.

Relation of District Death-rates from Consumption to House Accommodation.

"The mean death-rate of the City from *consumption* was 301 per 100,000 inhabitants (3·01 per 1,000). We shall call this the "Standard death-rate for consumption."

"Of the eight districts having houses *above* the "Standard House" as to size, and below the "Standard of Occupancy," all *except one* had a death-rate from Consumption *below* the standard death-rate. The exception was again District 10, or St. Andrew's Square, which had a death-rate of 343 from consumption. Of the 16 districts having houses below the "Standard House" as to size, and above the "Standard of Occupancy," *all except six* had a death-rate from consumption *above* the standard death-rate. The exceptions were, Districts 5, or Bellgrove and Dennistoun; 22, or Gorbals; 4, or St. Rollox; 20, or Lauriston; Springburn and Maryhill; and 2, or Port Dundas.

Relation of District Death-rate from Acute Diseases of the Lungs and Consumption together to House Accommodation.

"The mean death-rate of the City from *acute diseases of the lungs and consumption* was 880 per 100,000 inhabitants (8·8 per 1,000). We shall call this the "Standard death-rate from acute diseases of the lungs and consumption."

"Of the eight districts having houses *above* the "Standard House" as to size, and *below* the "Standard of Occupancy," all *except one* had a death-rate from acute diseases of the lungs and consumption *below* the standard death-rate. The exception was District 10, or St. Andrew's Square, which had a death-rate of 1·091 from these diseases.

"Of the 16 districts having houses *below* the "Standard House" as to size, and *above* the "Standard of Occupancy," all *except four* had a death-rate from acute diseases of the lungs and consumption *above* the standard death-rate. The exceptions were, Districts 5, or Bellgrove and Dennistoun; 4, or St. Rollox; Springburn and Maryhill; and 7, or Greenhead and London Road.

Relation of District Death-rates from Infectious Diseases to House Accommodation.

The *infectious diseases* are fever (typhus, enteric, undefined), smallpox, scarlet fever, measles, whooping-cough, croup, and diphtheria. The mean death-rate of the City from these diseases was 343 per 100,000 inhabitants (3·43 per 1,000). We shall call this the "Standard death-rate from infectious diseases."

"Of the eight districts having houses *above* the "Standard House" as to size, and *below* the "Standard of Occupancy," *all* had a death-rate from infectious diseases *below* the standard death-rate.

"Of the 16 districts having houses *below* the "Standard House" as to size, and *above* the "Standard of Occupancy," all *except four* had a death-rate from infectious diseases *above* the standard death-rate. The exceptions were, 5, or Bellgrove and Dennistoun; 4, or St. Rollox; 3, or High Street and Closes W.; and Springburn and Maryhill.

The New House Accommodation of Glasgow.

"In part I. of this Report, p. 36, I said:—"If we could ascertain the cubic contents of every dwelling-house or room we should get to the heart of this element of density in the physical circumstances of the inhabitants of the towns." In the preceding enquiry into the relation of the vital statistics of the districts of Glasgow to the mean number of persons per room in the houses of each district, I have been endeavouring to work out from this datum the relation of space in the house to the health of the inmates. We have found that in certain districts the general relation seems to be lost. In general it is the fact that a district which has houses occupied *above* the standard number of persons per room (*i. e.*, above the mean number of the whole City) has a general death-rate *above* the standard death-rate of the City; an infantile death-rate above the standard infantile death-rate of the City; and especially that the fatality of those diseases which are directly related to over-crowding or deficiency of breathing space, namely, diseases of the lungs and infectious diseases, is in excess in those districts.

"We obtain some conception of the size and social composition of this New Glasgow from a statement which I have compiled, from materials furnished by the Master of Works, of the number of dwelling-houses, classified according to size, for the erection of which authority was granted by the Dean of Guild Court in each year since 1866. That is the date of the present Police Act under the building regulations of which this *New Glasgow* has been erected. The detailed table is in the Appendix (No. XII). The following is a summary of the facts for the 15 years, 1866–80 :—

Size of House	No. of Houses		Population
1 apartment	10,439	......	32,361
2 apartments	22,960	......	112,504
3 do.	8,671	......	45,956
4 do.	2,383	......	12,630
5 do.	1,183	......	9,227
Total.........	45,636	......	212,678

"The population inhabiting these new houses is estimated from the average number of inmates per house of each size found at the census, as given in Table V., Appendix to Part 1 of this report. What does this statement show? That in the 15 years, 1866–80, we built, under the improved conditions imposed by the Glasgow Police Act, a city of 212,700 inhabitants, of whom 15 per cent. occupy houses of one apartment; 53 per cent. houses of two apartments; 2½ per cent. houses of three apartments; 6 per cent. houses of four apartments; and 4½ per cent. houses of five apartments and upwards. This is 42 per cent. of the whole population in 1881.

Air Space of a "Room" in New and in Old Glasgow.

"We have taken the number of persons per room as the best available representation of the comparative position of the inhabitants of the districts as to the air space. But it is evident that a "room," in a tenement built within the last 10 or 20 years, must represent conditions of space very much better than a "room" in a tenement in "Bridgegate and Wynds," or in "Gorbals," or in "Lauriston." *Externally*, we have fronting the modern tenement comparatively broad, well-aerated streets, and houses generally occupied as originally designed, and opening directly on the common stair; while in the old tenements we have back lands, narrow streets and alleys, and, above all, "made-down houses"—*i.e.*, houses occupied as one, two, or three-apartment dwellings, which were originally the kitchen, parlour, and bedrooms of large houses, access to which is obtained by long, ill-ventilated L and T lobbies. Internally, we have in the modern tenements loftier ceilings and more liberal dimensions, generally giving more cubic space per room than in the old tenements. This is a matter of too much interest and importance to be trusted to generalities. I have therefore obtained some measurements of the dimensions of small houses, of old and modern construction, which I have classified as follows :—

"1.—*Cubic Contents of Oldest Houses mostly Ticketed.*

Size of House	No. of Houses	Mean Cubic Space per House	Mean Cubic Space per Room
1 apartment	646	1,163	1,163
2 apartments	327	1,860	930
3 apartments	118	2,780	927

"There are 991 houses in this group, of which 426 are in High Street, Saltmarket, Bridgegate, King Street, Stockwell, and vicinity, the remainder in the oldest portions of the other districts of the City.

"2.—*Cubic Contents of more recent date, but still old Houses in Tradeston.*

Size of House	No. of Houses	Mean Cubic Space per House	Mean Cubic Space per Room
1 apartment	100	1,007	1,007
2 apartments	104	2,077	1,038
3 apartments	110	3,656	1,219

"There are 314 houses in this group, all in Tradeston, which was feud by the Trades House at the end of last century.

"3.—*Cubic Contents of New Houses in District 15, or Woodside.*

Size of House	No. of Houses	Mean Cubic Space per House	Mean Cubic Space per Room
1 apartment	100	1,268	1,268
2 apartments	100	2,498	1,249
3 apartments	23	3,722	1,240

"These 223 houses are nearly all in recently built tenements in Hopehill Road, and fairly represent the ordinary run of artizans' dwelling, erected by private enterprise, under the usual conditions of the Glasgow Police Act, 1866.

"4.—*Cubic Contents of New Houses, Oatlands and Overnewton.*

Size of House	No. of Houses	Mean Cubic Space per House	Mean Cubic Space per Room
1 apartment	116	1,344	1,344
2 apartments	137	2,637	1,318
3 apartments	101	3,999	1,333

"These 354 houses are all situated on the lands of Oatlands and Overnewton, which were purchased by the Improvement Trust, and feud in accordance with a plan carefully laid out by the Master of Works, reserving in each case a central square as breathing space. They represent the best class of modern artizans' dwellings in the City. The general effect of these measurements is to establish our contention that the unit "room" represents increased internal air space in tenements of recent construction as compared with those of old date. Of one-apartment houses the mean air space is, in old houses 1,163 cubic feet, in the Tradeston houses 1,007 cubic feet, in ordinary modern builders' tenements, 1,268 cubic feet, and in the Improvement Trust feus 1,344 cubic feet. It is only in the case of one-apartment houses that the old tenements have any advantage. They are larger than in the tenements of Tradeston. These commodious single rooms are almost entirely confined to the central district, and are found in the old houses of the early Glasgow gentry. Some of them contain over 2,000 cubic feet. Still this *internal* air space is deprived of its utility by the deficiency of the *external* air space, and the fact that they are occupied by the lowest classes in the community, among whom over-crowding is only kept down to the legal limit of 300 cubic feet per adult by constant night visitation and prosecution. In two-apartment houses the increase of air space per room is unbroken. Of the old houses the mean air space per room was only 930 cubic feet, of the Tradeston houses 1,038 cubic feet, in ordinary modern builders' tenements 1,249 cubic feet, and in the Improvement Trust feus 1,318 cubic feet. In three-apartment houses the same progressive increase is evident. Of the old houses the mean air space per room was only 927 cubic feet, of the Tradeston houses 1,219 cubic feet, in the ordinary builders' tenements 1,240 cubic feet, and in the Improvement Trust feus 1,333 cubic feet. If we calculate the mean air space of all those houses, one, two, and three apartments, in the four groups, we find that in the old houses it was 1,007 cubic feet per room, in the Tradeston houses 1,008 cubic feet, in the ordinary builders' houses 1,252 cubic feet, and in the Improvement Trust feus 1,322 cubic feet."

Height of Ceiling in Room of Old and New Glasgow.

The ceilings of the houses described vary from six feet to ten feet in height. On the basis of the facts given, Dr. Russell arranged the twenty-four districts of Glasgow into four groups, which represent a degradation of the physical conditions of health, especially as to air space in and around the dwellings of their inhabitants. The districts are so heterogeneous individually that no method of grouping them is possible so as to bring out in perfection the contrasts of those conditions, and their attendant, and consequent vital, results. For example, no district is purely inhabited by the upper classes. No district is wholly of recent growth so that its inhabitants can be said to illustrate the results of the most modern artizan dwellings. No arrangement of those districts can be adopted which will show the best or the worst possible results upon health, which may be expected from any set of physical circumstances which in the main they may illustrate. Still, having given this warning, the fact remains that we shall be able amply to illustrate the law that the comparative healthiness of sections of population is determined by the air space within and without their dwellings. We can classify the inhabitants of one city so as to produce four cities, which, though standing on the same soil, and exposed to the same sun and air, and general influences of nature, present contrasts in general mortality, liability to certain diseases, and other social and moral particulars, capable of statistical expression, which are related to physical differences, especially as to air space, which seem to be as effective for good and evil as separation by many degrees of latitude and longitude.

Dr. Russell has aggregated the sanitary districts of Glasgow into four groups of districts.

Group 1 comprises the five districts which had the lowest death-rates, and is the nearest approach to a selection of the better classes of the City which we can provide. We cannot say he gave the statistics of the west end alone, but this group comprises all the west end, with a large mixture of the middle class and best of our working class population. This group has 3·295 rooms per house, and 1·521 persons per room. The death-rate in three years was 23·9.

Group 2 contains six districts, and includes all the circumferential districts excepting the two west-end districts placed in the preceding group. It therefore contains the great mass of the recently erected industrial tenements in the city, and may be called New Glasgow, built under the Police Act of 1866. In 1881 forty-five per cent. of the whole population of the city lived in this group of districts.

Group 3 contains five districts, and comprises some of the old village centres which are now absorbed in Glasgow, and some of the first growth of the city at the end of last and beginning of the present century.

Group 4 embraces the remaining eight districts, which will be recognised as the worst districts of Glasgow both morally and physically. They comprise almost the entire area of the operations of the Improvement Trust.

Glasgow.—Comparative, Physical, and Vital Statistics of the four Groups of districts:—

	Group 1. 1881	Group 2. 1881	Group 3. 1881	Group 4. 1881
Population	124,028	228,098	75,333	84,061
Acreage	1,558	3,762	456	335
Density	80	61	165	251
Mean Death-rate	19·2	23·9	28·7	31·8

Group 1.	1881	Percentage houses of 1 room,	15;	2 rooms,	37;	5 rooms and upwards,	16
Group 2.	,,	,,	32;	,,	47;	,,	3
Group 3.	,,	,,	38;	,,	47;	,,	1
Group 4.	,,	,,	42;	,,	43;	,,	0·9

Mean Number of Rooms per House, 1881.

Group 1.	3·295	Group 2.	2·121	Group 3.	1·91	Group 4.	1·885

Mean Number of Persons per Room, 1881.

Group 1.	1·521	Group 2.	2·251	Group 3.	2·436	Group 4.	2·510

Mean Death-rate.

Group 1.	19·2	Group 2.	23·9	Group 3.	28·7	Group 4.	31·8

"The suburban boroughs around Glasgow contained, in 1881, 127,000. The mean number of persons per room 1·720, the mean number of rooms per house was 2·953, and the death-rate 20·4, 25·6, and 24·6 per 1,000. If we compare the number of persons per room in each burgh with the corresponding death-rate, we find that from Pollokshields, with 0·62 persons per room, and a death-rate of 10·1 per 1,000, the death-rate advances almost *pari passu*, with the number of persons per room, to Kinning Park, with a death-rate of 23·3 per 1,000 and 2·446 persons per room. Absolutely there is only one deviation where the death-rates can be accurately adjusted. The relation of the air space per room to the true death-rate would be strictly proportional."

It appears from the Report of Dr. Russell that new houses have been built in Glasgow, within a few years, housing or re-housing nearly a quarter of a million of people. I am not aware of any large city within which operations of this kind have been carried out so extensively. Looking at the extreme similarity of the population of Glasgow to that of Manchester, it is of supreme importance to note, as far as possible, the sanitary result as given by their very able recorder, the Medical Officer of Health for that city. Dr. Russell, for the purpose of comparison, has arranged the sanitary districts as already stated into four groups. Group 2 includes the largest portion of the newly-built artizans' dwellings, or what he calls "New Glasgow."

Group 2 he says contains the great mass of the recently erected industrial tenements in the city, and may be called "New Glasgow," built under the Police Act of 1866. In 1881 forty-five per cent of the whole population of the city lived in this group of districts.

If I understand correctly, these dwellings in No. 2 group have been erected partly by private enterprise, and partly from the proceeds of a Trust Fund by the Local Authority, or on land feud by the Local Authority, but all erected under somewhat stringent regulations of the Police Act, 1866. As much, or it may be all, of the land was feud by the Local Authority, it is probable that some of the land so feud consisted of the sites of former insanitary dwellings pulled down by the Local Authority

Let us see what has been the gain in the death-rate during the ten years, 1871–81, in the four respective groups into which Glasgow has been divided. In group 1, which contains a fairly good class of houses, the death-rate in 1871 was 22·2 per 1,000, and in 1881 it was 19·2 per 1,000. In No. 2 group (New Glasgow), the death-rate in 1871 was 28·3 per 1,000, and in 1881 it was reduced to 23·9 per 1,000, a gain of 4·4. In No. 3 group it was 31·7 in 1871, and in 1881 was lowered to 28·7, a gain of 3·0 per 1,000. No. 4 group Dr. Russell says is the poorest district in Glasgow, both physically and morally. The death-rate in 1871 was 38·8 per 1,000, in 1881 it was 31·8 per 1,000, a gain of 7·0 per 1,000.

Dr. Russell does not describe what the condition was of the sites forming No. 2 group in and prior to 1871, but the gain in the rate of mortality in the ten years, 1871–81, was 4·4 per 1,000, attributable in the absence of any other statement to the improved house accommodation for 212,000 people. In the meantime however a reduction of mortality equal to 3·0 per 1,000 had been going on in No. 1 and No. 3 groups, within which it does not appear that any such extensive building operations had been going on either as new buildings or re-erections. So far as the case stands, therefore, the gain from new and improved house accommodation has been 1·4 per 1,000. No doubt improvements such as we have been carrying out in Manchester have been operating in No. 1 and No. 3 groups.

No. 4 group represents an area of dwellings, with a death-rate of which we have known nothing in Manchester for very many years. Perhaps it represents Angel Meadow or Ancoats in their very worst days. The death-rate has been brought down from 38·8 to 31·8; however, it does not appear from new house accommodation but probably from general improvements, and it is in such districts that good sanitary operations are the most telling.

The grand result is that Glasgow has a general city death-rate of 26·2 and Manchester 26·4.

So impressed has Dr. Russell been in the course of his enquiries with the interdependence of cubical air space in relation to human occupation and the death-rate, that he scarcely hesitated to say that the relation is direct and absolute, and may under equal conditions be predicated. This was eminently the opinion of the late Dr. Farr. When on a visit to me he one day said, "Carry out all your external improvements, and then when you have finished give me the cubical area of a room and the number of its occupants and I will tell you its death-rate." Of course he did not mean a single room, or to ignore the disturbing influence of accidental circumstances, but he wished to express aphoristically this great fact that the most important factor in relation to health was the air space to the individual. Says Dr. Russell, "If we could ascertain the cubic contents of every dwelling-house or room we should get to the heart of the element of density in the physical circumstances of the inhabitants of towns." In an enquiry into the relation of vital statistics of the districts of Glasgow to the mean number of persons per room in the houses of each district, he has endeavoured to work out from this datum the relation of space in the house to the health of the inmates. In general it is the fact that a district which has houses occupied above the standard number of persons per room (*i. e.*, above the mean number of the whole City) has a general death-rate *above* the standard death-rate of the City, an infantile death-rate above the standard infantile death-rate of the City, and especially that the fatality of those diseases which are directly related to over-crowding or deficiency of breathing space, viz.:—Diseases of the lungs and infectious diseases are in excess in those districts.

In the census of Glasgow all the rooms in a house were counted, and this enabled Dr. Russell to estimate the number of persons per room. The buildings being in flats, many houses are contained in single tenements. The number of one-room houses is very large.

In England the rooms were not counted in the census, nor have we many houses associated in flats. There are in Manchester, except that kind of lodging-houses called "tenement house," very few one-room houses. Most of the artizans' houses in Manchester are of two stories, and are either two-roomed or four-roomed houses. They are built usually in long rows, all the houses and rooms in a row being usually of the same size, so that the measurement of the cubic contents of rooms or houses over a considerable area, which Dr. Russell so much longed for, will not be a difficult operation. The measurement of a very few rooms in a street will enable us to estimate the cubic contents of a whole street of houses. This has already commenced in Manchester 12 months ago. My former reports will have shown how Manchester has been divided into districts; how minutely these districts have been described; the quality, age, &c., of the houses given; and the inhabitants noted.

For some time past the exact area of these districts, including all they contain, has been in course of procedure; next the area of the occupied or residential houses alone in each district will be taken; and, lastly, the cubic space within the dwellings themselves. With this, and a knowledge of the number of occupants, we shall have an exact acquaintance of the relation of the breathing-room to the people—a true estimate of the relative density of the population throughout the City.

After what has been done, there can be little doubt that over-crowding is one of the most potent causes of a high death-rate, and it is of supreme importance to localise it when endeavouring to deal with the residential property of the City. Would it not be as efficacious to open courts, cut through streets, remove obstructive buildings, lay out spaces, and increase the air-space in houses by pulling down walls and enlarging rooms, laying two or, if need be, three houses together, as by pulling down great blocks of houses, at an enormous expense, as under Cross's Acts? The experience available to us at present does not indicate that the procedure under Cross's Acts is necessarily the best to follow out.

In 1877 Sir James Watson read, before the British Association for the Advancement of Science, a paper on improving the Sanitary condition of large towns, as illustrated by the City Improvements of Glasgow. Before the improvements were made in that City the population were crowded together in tenement houses of three or four stories, running backwards to the extent of 250 feet, to which neither light nor air could freely penetrate. A large portion of these dwellings were dark, dismal, and unwholesome. As late as 1871 the death-rate in one district was 70 per 1,000. To remedy this state of things measures were adopted by the Corporation. The City was surveyed with a view of clearing out the objectionable districts. The plan was a bold and extensive one; it swept away whole streets of unwholesome houses in order to obtain breathing spaces, and form broad spacious streets and open spaces in their stead. Power was asked from Parliament to expend £1,250,000 in the purchase of property, and to assess by taxation sixpence per pound on rental for five years, and threepence per pound for ten years. In the Parliamentary Session of 1866 the Improvement Act was passed almost without opposition, and immediately thereafter a Committee was appointed for carrying out its provisions.

A tax of sixpence per pound on the rental of the City, to be paid by occupiers, was imposed for the first year. Negotiations were entered into for the purchase of properties, and a bank credit was arranged for until the tax could be collected and money borrowed on the security of the trust. By the end of the first year the Committee had secured, by private bargain, property to the extent of £50,512, and loans had begun to come in freely on the security of the trust at the rate of four per cent. per annum. These purchases have gone on from year to year, and the sum paid for properties up to 31st May, 1877, amounted to £6,112,504. In addition to this the Committee purchased and paid £40,000 for a public park for the use of the citizens. The tax, which was sixpence in the pound for the first year, was in the second reduced to fourpence, at which it was continued for four years, namely, till 1871. Afterwards it was reduced to threepence for two years, and since then to twopence. In about two years after the passing of the Act there was commenced that process of demolition which has been carried on gradually up to the present time, by which old and dilapidated buildings were removed; the haunts of the criminal classes broken up; breathing spaces opened in pent-up lanes and closes; play-grounds procured for children; old streets widened; and new streets driven through the most densely crowded districts. The procuring of open play-grounds for children has in many cases wholly changed their sickly appearance to that of robust health. Between the years 1867 and 1873 there was a diminution in the total cases of crime annually reported of 3,030. In 1877 there had been provided 40,460 houses within the municipality, giving accommodation for 202,302 persons; while within a radius of half a mile of the City there has been provided accommodation for not less than 100,000, making a total accommodation for 302,300 to meet the natural increase of the population and the persons displaced by the Improvement Act. The property sold and in hand on 31st May, 1877, amounted to £1,647,332.

"It is proved beyond doubt that if the population be the same in other respects," says Dr. Farr, "an increase of density implies an increase of mortality, and that the ratio of increase in the mortality is as certain roots of the density.

The density of the population in the town districts was such in 1851 that 384 persons lived on 100 acres, while in the country districts 28 lived on the same ground, so that 14 were living in the same space in towns as was occupied by one in the country. It was shown in the Sixteenth Report that under our present imperfect sanitary regimen the mortality of the population increases in proportion as the population increases in density, and there must consequently be some relation between these elements. The source of the higher mortality in cities and towns over the country is the insalubrity of the atmosphere. Every human being expires about 666 cubic feet of gas daily, which, if collected in a receiver, would destroy other animals, and is constantly producing, in a variety of ways, the decomposition of animal and vegetable matter, yielding poisonous emanations in houses, workshops, dirty streets, and bad sewers. Instead of one individual to a square mile of land, locate 200,000 individuals as soldiers in a camp, and the poison will be concentrated 200,000 fold; intersect the space in every direction by 10,000 high walls which overhang the narrow street, shut out the sunlight, and intercept the movements of the atmosphere; let the rejected vegetables, the offal of slaughtered animals, the filth produced in every way decay in the houses and courts, or stagnate in the wet streets; bury the dead in the midst of the living, and the atmosphere will be an active poison which will destroy—as it did in London formerly, and as it does in Constantinople now—57 per 1,000 of the inhabitants annually, and generate, when the temperature is high, recurring plagues, in which a fourth part of the entire population will perish. If means could be devised for supplying the 200,000 individuals with 200,000,000 cubic feet of pure air daily, and for removing the principal sources of poisonous exhalations, a great change would be effected.

The latter object is partly accomplished by paved, even streets; by the scavenger; by an abundant supply of water; by large, well-conducted, trapped sewers, and by domestic habits of cleanliness; but it is difficult to see how impurities can be removed, and how a stream of uncontaminated air can be supplied, where the sun cannot heat the earth and air, where there are no open squares, or the streets are narrow, or the houses are only separated by courts or built in *cul de sac*. It will be found, *ceteris paribus*, that the mortality increases as the density of the population increases, and where the density and the affluence are the same that the rate of mortality depends upon the efficiency of the ventilation and of the means which are employed for the removal of impurities. It is not always the fact that the mortality is greatest in the densest part of cities, but very nearly so. The indigence of the inhabitants, or an insufficiency of proper food, even when not carried to the extent of starvation or famine, has a decided effect on the production of effluvial poisons, as well as on the tendency to diseases of every kind. Hence the mortality increases, *ceteris paribus*, as the density of effluvial poison generated in cities, and not strictly as the density of the population. Nevertheless, it is well established that the mortality of the populations of cities is generally higher than the mortality of people in the country, and there is a constant relation between the density of the population and the mortality. This has been tested by arranging all the districts (registration) in the order of their mortality during ten years, and then determining the density of their population. The general mortality of 631 districts ranges from a rate of 13 to 33 deaths in 1,000 living. The facts were arranged in five great groups, with the following results:—

1. Where the mortality was 14, 15, or 16, the population was in the proportion of 86 persons to one square mile.

2. Where the mortality was 17, 18, or 19, the population was 172 persons to a square mile.

3. Where the mortality was 20, 21, or 22, the population was of the density expressed by 255 to a square mile.

4. Where the mortality was at the rate of 23, 24, or 25, the population was of the density expressed by 1,128 to a square mile.

5. And where the mortality was 26 and upwards the average density was expressed by 3,399 persons to a square mile.

Thus in these five groups there is a constant increase of mortality running parallel with the increase of density."

Dr. Farr arranged in tables all the deaths recorded in ten years in all the districts of England and Wales, and he constructed a table showing what was the observed relation of the mortality to the number of persons living on a square mile, or to the density of the population, and also what was the mortality calculated on the density of population.

Annual Rate of Mortality per 1,000 *in several groups of districts of England and Wales (exclusive of London), and the Mortality deduced from the densities of population in these groups.*

Number of Districts in each Group	Range of Mortality	Density of Persons to a square mile	Proximity in yards	Observed Mortality	Calculated Mortality
345	18·20	186	139	19·16	19·16
137	21·23	379	97	21·88	20·87
47	24·26	1,718	46	24·90	25·02
9	27·30	4,499	28	28·08	28·08
Liverpool District	39·	65,823	7	38·62	38·74

The table may be read thus:—In 47 districts having a density of 1,718 persons to a square mile, a proximity of 46 yards, the annual mortality (1861–70) ranged from 24 to 26—the exact mortality was 24·90 per 1,000. The mortality calculated from that of the 345 districts having a mortality of 19·16, a density of 186 persons to a square mile, was 25·02, thus differing from the actual mortality by only 0·12. The districts being grouped in the order of the mortality the density of population is always found to increase with the mortality, but more rapidly. The greater the proximity of man to man the greater is the mortality.

Manchester, for a good many years past, has been a growing town, but the houses are intermixed, of various ages, and not capable of being compared with the new part of Glasgow. There is one entire township, however, which is entirely the growth of the last 10 or 15 years—that of Beswick. In 1871 the houses were so few that they did not constitute a sufficient basis for sanitary calculation. At the present time the township contains about 10,000 inhabitants, who are lodged in respectable cottage houses, situated in good, wide streets, well drained and paved, and the houses built in accordance with the latest requirements of the Corporation. They are all of two storeys, with rooms a little larger than in the ordinary Manchester cottage house. There are no back to back houses, and no cellar dwellings. The houses have all yards to the backs, and five feet passages and 24 feet air space between the backs of the houses. The death rate in these houses is almost exactly the same that Dr. Russell has found in the new town of Glasgow. The inhabitants are of the same class, and engaged in very similar occupations. In relation to surrounding districts, which are in a worse sanitary condition, the death rate is higher, and the infant mortality is beyond what might have been expected.

So closely does the death-rate of most places follow the density of population; or, in other words, so closely associated is the cubical space of dwellings to the resident occupants in relation to their health, that it is natural to seize upon the known impurities of the air of the dwelling as a principal cause of the abnormal mortality. Ordinary gases, such as carbonic acid, sulphuretted hydrogen, and the like, are so excessively diffusible that they escape into the general body of the air. Those impurities however which constitute the foulness of an atmosphere are probably neither gaseous, vaporous, nor liquid, but consist of solid particles of organised matters, some of which may be living and others in a state of decomposition. They give to the atmosphere a foul and offensive smell, cause a feeling of closeness and irrespirability to the air, and their continued inhalation causes a deterioration of health and renders the residents in such an atmosphere peculiarly liable to the reception of special forms of disease. Consumption, diseases of the lungs, and what are called infectious diseases seem to be especially promoted by them. In the present state of sanitary science no more important investigation could be undertaken than that of the peculiar nature of these floating particles. Physically, and in a general sense, Dr. Farr, Dr. Russell, and many other sanitary enquirers have dealt with this in a statistical form. Dr. Russell, in one of the latest reports on the subject, as already stated, has shown that as regards Glasgow, where a certain addition or almost any addition to the impurity of the atmosphere of any given cubical space is made by the addition thereto of residents above the mean number, as indicated by the mean number of residents per room, the ill-health and consequent increased mortality is almost consequently consecutive. What is now wanted is that we should know something of the nature of this poisonous matter. The late Dr. Angus Smith constructed a closed room in which he placed himself for varying periods. After a time the atmosphere always became close and offensive, and unpleasant sensations were created, particularly obvious to persons entering the room soon after he had left it, and these phenomena increased in intensity with the duration of his stay in the room.

Dr. Smith made many attempts to isolate or to individualise the matters which produced these unpleasant effects. They are probably many, but which are specially injurious and which comparatively harmless we know little. The actual presence of organic matter in such an atmosphere may be however distinctly recognised. Many years ago, when living in St. John's Street, and being strongly interested in this special department of enquiry, which seemed at that time to have met with but little attention, I instituted a series of experiments in inhabited cellars, and in small and crowded rooms in the back streets running off Deansgate. I used various re-agents, contained in specially shaped bulb-tubes, such as a mixture of glacial sulphuric acid with common oil of vitriol and Nordhausen sulphuric acid. I also used salts of manganese, and with all I got indications of organic matter polluting the atmosphere, and in varying degrees, according as I could judge by the smell of the foulness of the atmosphere. I communicated the results to my late friend Dr. Farr, and some of them were published, I think, in the quarterly reports of the Registrar-General.

The investigation would be a laborious, a tedious, and a long one, but it would be difficult to exaggerate its importance. The first object of the enquiry would be to ascertain the relative amounts of total impurities in different localities, and then a much more difficult matter to endeavour to discover some tests for the particular impurities constituting the vitiation. It would seem almost hopeless to succeed in the latter delicate investigation, and yet so wonderfully full of scientific energy and patience have been the last few years in the discovery of matters equally difficult, that even this may loom in the distant future, and who shall say that we may not be able at some time to give almost a chemical expression to the disease and mortality of particular districts.

One thing, however, is clear. Seeing how much has been done in Manchester outside the dwellings of the people, our next duty should be to give abundance of air circulating and playing round about the houses of the people, sweeping the narrow streets and passages, coursing through the houses, and carrying with it all that is foul and noisome and injurious to health.

The Medical Officer of Health for Wolverhampton, in his last report, calls attention to the different velocities of the atmosphere, in different portions of his district, showing with what a rapid sweep it traverses some portion thereof, how diminished the current in more confined places, and how sluggish and little interchangeable in narrow courts, passages, and pent up places. How rarely and through what wide intervals can the body of the air be said to be changed in places surrounded by buildings like some courts of which we have abundance.

The late Dr. Robert Angus Smith in his work entitled "Air and Rain," published in 1872, laid, perhaps, the proper foundation of any future researches and experiments on the organic constituents of the atmosphere, and so closely do his experiments and observations touch on this portion of my report that I shall cull from it, not always with specific acknowledgment, such portions of his work as throw light on the quantity and specific characters of such substances as make up the organic impurity. Organic matter, says Dr. Smith, has been long known to exist in the air. The part that has excited most attention is the existence of organised forms because of the practical questions regarding the conveyance of disease and the commencement of putrefaction.

The tendency of enquiry in modern times has been to establish a very ancient belief that decomposing substances, animal and vegetable, produce disease, and are ultimately connected with infection and contagion. This result may be said to be the summary of all that has been done by the General Board of Health and Sanitary Commissioners of late years. The decomposition of organised beings after death produces gases and vapours that are opposed to health, yet these gases or vapours are incapable of originating, although they may be capable of feeding, those diseases, such as cholera or plague, which have been observed in all times to come from a warmer climate.

This is sufficiently made out that when these diseases do come amongst us they take root with most effect in those places where decomposing matter is found. The investigations of Pasteur seem to have proved that we may now with certainty reason in the belief that not only are organised substances really found in great abundance in the atmosphere, but that they are the cause of some hitherto entirely mysterious phenomena, putrefaction included. If we examine previous enquiries into the compounds resulting from the decomposition of organic substances we shall find nothing which is at all calculated to bring out such an intelligible view of the origin of many diseases, and also of some phases of putrefaction. Chemists, when they have examined products of the latter action, have found sulphuretted hydrogen, carbureted hydrogen, hydrogen, carbonic acid, nitrogen, ammonia, acetic acid, lactic acid, butyric acid, and numerous uncertain bodies having no activity and to all appearance utterly incapable of producing those prodigious results that are found when that force begins to work which produces plague, smallpox, or black death.

Is the cause of disease an organic substance in the process of decomposition conveying that decomposition to another body, or is it an organised germ?

There are two great theories on this matter: Liebig's and Pasteur's,—Liebig dealing with organic decomposing matter ready to communicate its action by its own activity. Pasteur's leads to organised bodies or germs, and though he is in the position of not having originated the idea, the clearest proof and expression is due to him. Having observed that the breath contained organic matter, and that the emanations from crowds of persons were found, when condensed on the walls, to contain large quantities, Dr. Smith published some experiments in the Memoirs of the Chemical Society for 1846. Dr. Smith found that by breathing through a tube into a bottle the condensed breath will be collected at the bottom of the bottle, or by breathing through a tube into water a solution of the same substance will be found in the water. If this be allowed to stand for a few days it will become the abode of small animals. Their presence is a proof of decomposing matter, as their production is one of the various ways in which organised structure may be broken up. Such a liquid must of course be an injurious substance, giving out constantly vapours of an unwholesome kind. The windows of a crowded room are moistened with a quantity of matter condensed on the glass. It also condenses on the walls. If taken up by a pipette and allowed to stand some time it forms a thick apparently glutinous mass, which, when examined by the microscope, is seen to be a closely matted confervoid growth, or, in other words, the organic matter is converted into confervæ. Between the stalks of these confervæ are to be seen a number of greenish globules constantly moving about.

If air be passed through water a certain amount of this material is also found. When this exhalation from animals is condensed on a cold body it in course of time dries up and leaves a somewhat glutinous organic plaster. We often see a substance of this nature on the furniture of dirty houses, and in this case there is always a disagreeable smell perceptible.

The moisture condensed from a crowded room was thick, oily, and smelling of perspiration, capable of decomposition, and productive of animalcules and confervæ. Dew from the country, collected about the same time, was beautifully clear and limpid, and when boiled down the odour was not disagreeable.

Dr. Smith's experiments were chiefly made with manganate and per manganate of potash. A given quantity of a weak solution was put into a bottle and brought into contact with measured quantities of air until decolourised. The quantities required for the production of this effect were very unequal. The following number of grains of per manganate of Potash were decolourised by 100 cubic inches of air from the places mentioned :—

Lake Lucerne	1·4
At Lea, 60 miles from Yarmouth	3·5
Epping Forest	16·0
Street in Fetter Lane	30·0
Wellington Street	45·0
Southwark Bridge	55·0
All Saints', Manchester	40·0
Air drawn from a pig stye	70·0

The following figures show the relative amount of albuminoid ammonia in equal quantities of air :—

Woburn Square	15·573
Street off Regent Street	42·575
Yard, St. Catherine's Docks	36·758
New Kent Road	37·705
Kennington Park	25·981

The following exhibit the mean of four experiments :—

Ammonia in solution	19·028
Organic ammonia in solution	20·165
Ammonia in solid	1·858
Organic ammonia in solid	37·245

Albuminoid ammonia results from the decomposition of organic matter, animal or vegetable. It is in a transition state, and on its way to the production of free ammonia or its salts. It is an evidence of the decay of nitrogenised organic matter, and to a large extent, therefore, of an unhealthy or polluted atmosphere. It is increased by population, living beings raise the numbers, but still more these abrasions and off scourings. By this we can test the amount of ventilation either of a close or open situation.

Albuminoid Ammonia—Grains per million cubic feet of air.

Dr. Smith's Laboratory		116·525
		128·177
Yard behind Laboratory	from	41·538
	to	155·764
Dr. Smith's Bedroom	from	83·074
	to	146·210
Midden	from	103·841
	to	233·050
Hyde Park		37·965
Westminster Abbey Yard		37·381
Chelsea		48·180
Woburn Square		58·148
London Bridge		61·166
Bank of England		62·301
Buck Street, Lambeth		105·595
Union Street, Glasgow		178·016
Glasgow		133·264
Office at Manchester		116·544
Innellan		100·
London		109·
A Bedroom		173·
Inside of Office		193·
Glasgow		221·
A Midden		301·

That organic matter, the debris of living bodies, exists in the air can be shown by incontestable proofs. They may be recognised by the senses, and made evident by the scientific processes of the chemist. It has been rendered almost certain by Pasteur that fermentation and putrefaction does not go on without the presence of organisms, and most likely living organisms. By passing air through cotton wool these organisms can be so filtered out that the filtered air finding entrance to a vessel containing flesh does not set it into putrefaction. The solid bodies contained in the air were deposited on the cotton wool through which the air passed. The organic substances were destroyed by heat a little above or below that of boiling water, and would not afterwards excite putrefaction or fermentation. The nature individually of these bodies, both as regards quantity, character, and functions, is what now requires investigation. For some time attempts have gone in the direction of measuring the quantity of matter in a comparative way, and there was more an inclination to look at the amount and the state of decomposition than the form, which latter must now be important. Pasteur first gave the substances duties to perform, giving, in fact, a finish to the inquiry up to this stage, namely, that putrefaction and fermentation are begun only when there are present in the air bodies which are not gases or vaporous, but solids, and have an organic structure, or are living.

Dr. Dundas Thompson has given drawings of the substances found in the wards of a Cholera Hospital, in the atmosphere of a sewer, and in the external atmosphere. He arrived at the following conclusions :—

1. That in the atmosphere of a cholera ward mechanical matters were diffused throughout the air derived from the inmates ; the sporules of fungi and germs of vibriones, or vibriones themselves, were obtained by filtration from the atmosphere, all of these bodies being adulterations so to speak of the pure oxygen and nitrogen which alone constitute the wholesome predominating constituents of the elastic fluids destined for respiration.

2. That from a ward only partially filled with patients affected with cholera substances were separated which were mechanically dispersed to the very summit of the apartment mixed with fungi or their sporules, while no vibriones, unless in the form of faint traces, could be detected.

3. That in the atmosphere of an empty ward, communicating, however, with a ward containing cholera patients, mechanical matters were obtained, and traces of fungi and perhaps of vibriones.

4. That in the external air adjacent to an hospital substances mechanically distributed were likewise found, and sporules with fungi were also detected to a considerable extent, but no vibriones.

5. That in the atmosphere of a sewer bodies were also found in mechanical diffusion associated with sporules, fungi, and vibriones.

6. That the air obtained under the three first conditions from wards possessed an acid reaction, that the external air likewise indicated a similar chemical condition, and that the sewer atmosphere was alone alkaline.

7. That although animal and vegetable life seems unequivocally to be diffused through cholera atmospheres, it would be premature to infer a "connection between the disease and those organisms until comparative trials have been extensively made on other conditions of air, and that the present researches must only be considered as a single stone placed as a contribution towards the foundation of a large structure."

Dr. Smith received from Mr. Crooks some liquid which he had condensed from the air of an infected cow-shed, at a space a little above the head of a diseased cow. This presented indications of very small, nearly round, bodies presenting no structure, or at least only feeble traces of it, and perhaps to be called cells. It was condensed by means of cotton wool. The bodies clearly belonged to the organic world and were not in all cases mere debris.

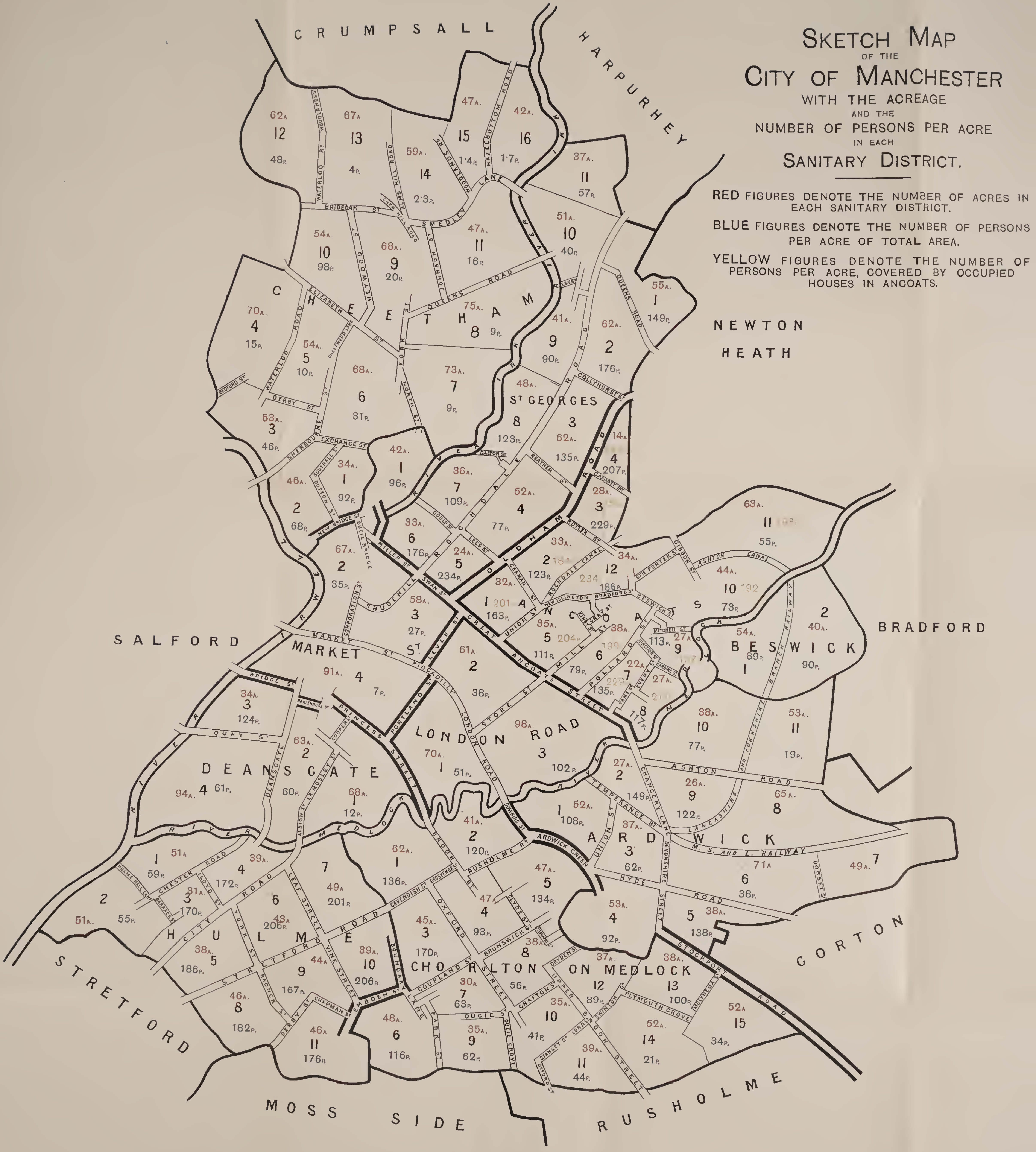
At first there was no motion whatever, but in a day there was very abundant motion, with specimens of a body resembling the englena. Dr. Smith found similar indications in a cow-house with healthy cows, so these were not necessarily connected with the cattle disease. Dr. Smith washed a large quantity of air with distilled water. The operation was conducted behind his laboratory, in the neighbourhood of places not very clean. The operation of washing was repeated 500 times and occupied a considerable period. The liquid was cloudy, and the unaided eye could perceive that particles were floating. It was examined microscopically by Mr. Dancer. Mr. Dancer found first spores or sporidiæ of fungoid matter in great numbers. He calculated that a single drop of the water that had been used for washing the air contained 250,000 of the spores. These varied from the 10,000th to the 50,000th of an inch in diameter. The mycelia of these minute fungi were similar to that of rust or mildew, such as is found on decaying vegetation. After 36 hours the quantity of fungi in the water had visibly increased, and a delicate mycelia thread-like roots had completely entangled the fibrous objects contained in the water and formed them into a mass. On the third day a number of ciliated zoospores were observed moving freely amongst the sporidiæ.

The next in quantity of the particles in suspension was vegetable tissue of various kinds, and in three or four days animalculæ made their appearance in considerable numbers, the monads being the most numerous, together with specimens of paramecium aurelia. The small amount of fluid left in the bottle emitted the peculiar odour of mildew. The fluid sent by Dr. Smith to

Mr. Dancer contained 150 drops, and as there were in each drop 250,000 spores, the 150 drops contained 37½ millions, and these were collected from 2,495 litres of the air of Manchester.' The weight or quantity of these bodies is illustrated by the production of albuminoid ammonia from the air, and has a relation to that substance. They are not merely dry dust driven up by wind, but are usually associated with vapour. They are found, as Dr. Thompson showed, in sewer and hospital air. They are less after rain, which washes them down to the earth. The death-rate is often lowest in the wettest counties. They may dry up in great heat, and the organic matter shrivel up. The wind drifts about these minute objects. Does any harm come from breathing them? It has been abundantly proved that air from middens and such impure places is less wholesome than air from free and open places, and this has been the basis of the whole sanitary movement of late years. It is known that no variation in the quantity of oxygen, or of carbonic acid, or of ammonia salts, or nitrates, can produce infectious diseases, fevers, or putrefaction, or even special diseases. Gases, vapours, albuminoid substances, plants, and animals must all produce their peculiar effect in the atmosphere. But we have not learnt to individualise their action. So first arises the question: Is it the chemically changing and decomposing or the living matter that does harm? There are important decompositions of organic substances which do not proceed without the presence or intervention of some vibrio, or at least of some organism. It seems that the decay of organic substances without the presence of organisms is much slower than with it. Flesh freed from certain organisms will keep long, even if moist; but the change caused when the usual occupants of the atmosphere are present is one so rapid that it can only be compared to the chemical action of inorganic bodies. The parts of which we are composed are continually undergoing change; the blood and all the fluids are especially active. In some diseases the changes are excessively active. In cholera the decompositions that take place go on with fearful rapidity. The solids of the body are transformed with a speed which has always been compared to that of putrefaction. We know of no action of neutral organic bodies at low temperatures so rapid as this without the presence of organised structure, great or small.

Taking the average germ to be one 5,000th of an inch in diameter, Dr. Smith calculates that we should then have 529,560,000,000 germs in a million cubic feet of air equal to about two cubic inches of them. The number of organisms in 88 cubic feet, the amount of air washed by the liquid sent to Mr. Dancer, was calculated by him to be 37,500,000, or 426,000 germs in one cubic foot.

Dr. Russell's statistical observations in Glasgow, Dr. Smith's experiments and researches, and our own observations in Manchester, make it certain that when a larger number of human beings are congregated in a volume of air insufficient for the full purposes of life, or when the change of air is not sufficiently frequent for the same purposes—in other words, when there is deficiency of ventilation—that there will be an accumulation of organic particles originating in organic functions, mainly the acts of respiration and perspiration, injurious to health and ultimately to life. That these particles, whether the results of decay, which may probably be putrefactive or germs, that they are either singly or in association direct poisons to the animal frame, and in a certain accumulation directly produce disease as typhoid ; or if more dilute to reduce the tone of the system as to render it abnormally susceptible of the ordinary causes of disease. Dr. Smith has shown that a certain concentration in the atmosphere is needed for certain specific effects, and that an infected atmosphere may be so diluted as to be unable to cause diseases in ordinarily healthy people. This dilution may be affected by sufficient currents of air blowing through localities in which a morbidly foul atmosphere is found, pointing to the necessity of opening out courts, passages, and narrow streets. Long narrow streets should have openings made into them at moderate intervals, so that cross currents of air may be obtained. In the present state of advanced enquiry it is best to accept the doctrine of the existence of poisonous organic matters proceeding from the human frame, which have the properties of absolute poisons, and the removal of which is as necessary as of foul water and bad food. Hence open spaces should be provided also, as numerously as possible. In a town like Manchester it is conceivable that, without pulling down great blocks of property, much may be done to ameliorate the conditions under which people live by opening out closed places, laying together rooms of insufficient size, and by whitewashing with quick-lime, at frequent intervals, the entire wall space of a house, so as to present a new and clean surface to the inhabitants of the houses. Ordinary house plaster is exceeding porous, and absorptive of animal matters. The whitewash would keep in these matters, which would rapidly decompose and become converted into harmless matters in their porous receptacles. So much has been done outside the dwellings of the poor that it is necessary to look for the next great factor in the abnormal mortality of the people of Manchester to look within their dwellings, and we shall there find in the foul atmosphere in which they constantly live and breathe this great factor in their mortality.



SKETCH MAP OF THE CITY OF MANCHESTER WITH THE ACREAGE AND THE NUMBER OF PERSONS PER ACRE IN EACH SANITARY DISTRICT.

RED FIGURES DENOTE THE NUMBER OF ACRES IN EACH SANITARY DISTRICT.

BLUE FIGURES DENOTE THE NUMBER OF PERSONS PER ACRE OF TOTAL AREA.

YELLOW FIGURES DENOTE THE NUMBER OF PERSONS PER ACRE, COVERED BY OCCUPIED HOUSES IN ANCOATS.

Scavenging.

The City for cleansing purposes is divided into 10 sanitary districts, over which are 10 Inspectors, who supervise both streets and closets.

There are 491 lineal miles of streets within the City, 900 miles of footpath, and 350 miles of courts and passages.

The streets are divided into three classes: the first-class streets are swept every day except Sunday, the second-class streets are swept three times a week, the third-class streets twice a week, and the markets daily, including Sunday.

The sweepings are collected during the progress of the work, and on no occasion are left on the streets more than an hour; they are then carried to the various depôts outside the City.

The weight of sweepings collected each week is about 900 tons, the bulk of which is at once taken to the tips, except when the streets are very wet; the slops are then taken to the various yards, where they are left to drain, the sediment afterwards being removed.

The thoroughfares in the markets are swept three or four times a day, and on an average 65 tons of garbage are collected per week; it is a mixture of cabbage, rotten turnips, onions, celery, lettuce, potatoes, and other kinds of vegetables; also the entrails of rabbits, bad fish, &c., from the fish markets. Sometimes the latter is sent away with the nightsoil; at other times it is sent direct to the farmers, if they can be induced to have it; it is also destroyed by burning.

During the last summer the whole of the potatoe tops which were brought to the market, and which amounted to many tons per week, were burnt.

During the 12 months ending March, 1886, there were 375,982,549 yards of surface swept, and 51,733 loads of sweepings carted off the streets. The public urinals within the City are washed and disinfected twice per day.

There are 54 private slaughter-houses in the City, and the greater part of these are visited by the Health Committee's servants once a day; the remainder twice a day.

The public abattoirs, in which during the past year about 180,000 head of cattle were slaughtered, are visited five or six times per day for the removal of offal.

About 65 tons of garbage is collected each week; the vegetable portion of the garbage is sent away with the night-soil, the animal portion being disintegrated, and the nitrogenous matter mixed with the concentrated manure; the fatty matter is used for other purposes.

During the past year 90,000 street gullies were opened and cleansed.

There are at the present time six bell-carts regularly employed in the collection of bell-dust. There are about 20 loads removed on Mondays, Wednesdays, and Saturdays, and about 24 loads on Tuesdays, Thursdays, and Fridays.

No refuse is removed by the Collector except it be placed in position and in a receptacle approved by the department.

During the 12 months ending March, 1886, 4,467 loads of bell-dust were collected.

NIGHTSOIL.

There are in the City 66,000 dry ash-closets, or what are commonly called pail-closets, together with 40,000 dust-bins, 11,000 water-closets, 4,000 middens, 50 public urinals, besides urinals which are connected with each of the railway stations.

The contents of the water-closets and urinals flow through the drains and sewers into the rivers.

The contents of the pail-closets are removed each week, in some cases twice, and in others three times a week.

Each van is provided with 24 clean and covered pails, with space for the domestic refuse of 30 houses.

The aggregate weight of closet contents and domestic refuse collected by each van is 3,000 tons per week.

The material is taken to the depôts, where it is sifted, screened, sorted, and utilised.

The pails, when emptied, are well washed, as are also the covers, and any found defective are put aside to be repaired.

The vans are then cleansed and sent away for more pails.

At Holt Town depôt about 250 tons of closet and other refuse are reduced daily to about one half their weight by evaporation and burning, and are converted into inoffensive material.

With respect to the manure, the Committee know no system which could be adopted with equal advantage to dispose of some seventy or eighty thousand tons of refuse collected in that part of the City.

During the 12 months ending March, 1886, 160,753 loads of nightsoil were collected.

Since the 1st of October, 1885, the streets and closets in the respective townships of Harpurhey, Bradford, and Rusholme have been thoroughly cleansed, and the health of the inhabitants regarded with equal solicitude as the health of residents in other parts of the City.

Statement of Matter Received and of its Disposal, for the 12 Months ending March, 1886.

Collection.	Tons	
Water Street Yard.		
To Daysoil	75761	
,, Nightsoil	528	
,, Ashes	2187	
,, Slaughter-house Refuse	4757	
,, Fish Refuse	319	
,, Lime	860	
,, Stable Manure	732	
		85144
Holt Town Works.		
To Daysoil	74977	
,, Nightsoil	9487	
,, Ashes	2199	
,, Slaughter-house Refuse	534	
,, Street Sweepings	1397	
,, Market Garbage	331	
,, Fish Refuse	30	
,, Stable Manure	972	
,, Lime	305	
,, Shale	651	
,, Clay	276	
,, Chemicals	1209	
		92368
Water Street Scavenging Yard.		
To Market Garbage	2460	
,, Street Sweepings	48977	
,, Warehouse Refuse	4467	
,, Stable Manure	51	
		55955
		233467

Disposal.	Tons	
By Nightsoil	47173	
,, 3206 Tons of Clinkers, converted into Mortar	6099	
,, Stable Manure	732	
,, Iron, &c.	98	
,, Rubbish to Tip	5787	
,, Sundries	4105	
		63994
By Concentrated Manure	5423	
,, Nightsoil	4185	
,, 1859 Tons of Clinkers, converted into Mortar at Holt Town	1796	
and Oldham Road	1450	
,, Street Sweepings	147	
,, Market Garbage	140	
,, Stable Manure	972	
,, Iron	165	
,, Rubbish to Tip	23545	
,, Sundries	423	
,, 5002 Tons of Clinkers, converted into Bricks	5929	
		44175
By Street Sweepings	3379	
,, Market Garbage	2606	
,, Stable Manure	51	
,, Rubbish to Tip	22504	
,, Sundries	290	
Leakage	96468	
		125298
		233467

DISINFECTION.

This section of the work of the department comprises the suppression, as far as possible, of all infectious diseases—the closing of unsanitary houses, the prevention of overcrowding of dwellings, a constant supervision of the surroundings of all houses, and an oversight of the City in all matters pertaining to the public health. Upon receipt from the medical practitioners, or from any other source, of information of any cases of infectious disease, as required by Act of Parliament, an Inspector is despatched to the house to render all the assistance in his power, and to take such steps as may be desirable to prevent the spread of infection to others. Measures are taken for the complete isolation of the patient, and, should the house be too small to afford facilities for such isolation, the patient is carefully removed to the hospital. Disinfectants are liberally supplied, and instructions given as to their use. There are four officers engaged in this work. After the removal of a patient, or upon his recovery if treated at home, the house, if it is required, is thoroughly cleansed and purified by a staff of disinfectors, who strip the paper from the walls, and wash the walls, ceilings, and painting with a strong solution of caustic soda. In all cases the bedding, carpets, curtains, and similar goods are removed to a depôt and purified in an oven heated to about 270 degrees, after which they are returned to the house.

During the year 1886 there have been 807 houses thoroughly cleansed, and the remainder disinfected.

The following are the number of cases of infectious diseases reported, and the number sent to hospital during 1886 :—

	Smallpox	Typhus Fever	Typhoid Fever	Scarlet Fever	Puerperal Fever	Diptheria	Total
No. of Cases	8	... 43	... 474	... 1657	... 27	... 111	... 2320
No. of Cases sent to Hospital......	8	... 35	... 141	... 951	... 0	... 20	... 1155

JOHN LEIGH,
Officer of Health.

Town Hall,
17th May, 1887.